Technical Memorandum

Subject: **EPA Comments on *Rosemont Copper Project – response to Corps staff comments of April 16, 2014 on Habitat Mitigation and Monitoring Plan***

To: **Marjorie Blaine, U.S. Army Corps of Engineers, Los Angeles District**

From: **Robert Leidy, PhD, U.S. EPA, Region 9**
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Date: **April 28, 2014**

On April 16, 2014, Colonel Colloton provided Rosemont Copper with staff comments on the *Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit NO. SPL-2008-00816-MB* (April 1, 2014) and requested submission of a Final Habitat Mitigation and Monitoring Plan (FHMMP) by April 24, 2014.

EPA has reviewed Rosemont's April 24, 2014 submittal to the Corps which supplements Rosemont's FHMMP and is providing you with the following comments. To assist you in your review, we have included the Corps comments, Rosemont's response, followed by EPA comments.

Our review of the FHMMP documents affirms our position that the mitigation does not comply with EPA's 404(b)(1) Guidelines and the requirements of the 2008 Mitigation Rule. Most of the concerns we expressed in our April 9, 2014 Technical Memorandum remain unaddressed.

The mitigation proposed by Rosemont fails to offset the mine's impacts to aquatic resources in the Cienega Creek Watershed:

- The proposed constructed channels at Sonoita Creek Ranch (SCR) are not designed as self-sustaining, unconstrained or naturally functioning floodplain channels and will not provide significant and lasting ecological benefits to the aquatic ecosystem. There continues to be significant risk they may fail to function as designed.
- Rosemont has not demonstrated there is sufficient water from Sonoita Creek or Monkey Spring to support any of the mitigation proposed at SCR.
- Rosemont's qualitative methodology comparing the functional loss associated with the mine impact site and the function gain at the mitigation sites is scientifically flawed and unsupportable and therefore, not valid.
- Proposed enhancement activities at Fullerton Ranch and SCR are highly questionable. Rosemont has failed to demonstrate clearly any benefit from mitigation at Fullerton Ranch.
- Performance Standards used to determine whether the compensatory mitigation project is achieving its objectives are lacking or insufficient.
- The temporal loss of waters could be significant due to a lengthy and risky ADWR approval process.

Section 2 Mitigation Objectives

Comment 1

Corps Comment 2.2 (p.1): *Please verify how Rosemont ("RM") derived 344.7 acres of floodplain and xeroriparian buffer habitat associated with the reestablished channels. The existing agricultural field is 115 acres and the additional area south of the original site is a total of 148 acres with a current total design for 52 acres of WUS. In regard to the enhancement of 27.4 acres of existing ephemeral channel, please indicate the acreage which pertains to the existing Sonoita Creek and the acreage which pertains to the ephemeral tributary channels to the east of the agricultural field.*

RM Response (pp. 1-2): *With the revised constructed channel design at Sonoita Creek Ranch, the floodplain and xeroriparian buffer habitat have been recalculated. The area for the floodplain and xeroriparian habitat buffer is 234 acres, which includes 96 acres of the 115-acre existing agricultural field, approximately 78 acres associated with a 100-foot buffer along Sonoita Creek, and 60 acres associated with the 100-foot buffer for the constructed channel outside of the agricultural field (**Figure RC-1**). The buffer area will be replanted where channel construction will remove existing vegetation. As described in the HMMP, the construction channel will function as a system, along with the associated riparian floodplain and the existing Sonoita Creek channel, to convey flows and provide floodplain habitat for approximately 3.5 miles. Although the Corps has indicated that a 50-foot buffer is appropriate for ephemeral washes in Arizona, the substantial size and flow capacity of Sonoita Creek would seem to warrant a larger (100 ft) buffer. (If a 50-foot buffer is utilized, the total area goes from 234 acres to 175 acres.) This area also assumes an OHWM in the constructed channels based on the 10-year, 24-hour storm event.*

The area of Sonoita Creek within the mitigation parcel is 18.2 acres; the area of other ephemeral waters within the mitigation parcel is 9.2 acres.

EPA Comment: Rosemont's Final Habitat Mitigation and Monitoring Plan dated April 24, 2014, (FHMMP) calculates the total lengths of constructed channels on SCR and South SCR as 13,485 feet and 3,606 feet, respectively; for a total constructed channel length of 17,091 linear feet. A 50-foot riparian buffer along both sides of the constructed channels would total 39.23 acres of riparian buffer habitat. A 50-foot buffer width is ecologically justified given that the entire project site outside of the 50-ft buffer lies within the protected project site. In addition, the scientific literature shows that most of the ecological benefits of buffers along streams accrue within the first 30 feet of a buffer, especially on sites that are not bordered by a steep hillslope or incompatible land uses; such is the case at SCR. In addition, because the constructed channel and its banks will be wide (i.e., banks constructed at a 10:1 slope) the channel corridor itself provides existing buffer habitat above the low flow channel elevation. Therefore, a 50-foot buffer will ensure the long-term viability of aquatic resources, as consistent with the 2008 Mitigation Rule (33 CFR 332.3(i). On Figure RC-1, RM is requesting 96 acres of the 115-acre existing agricultural field as "re-established riparian floodplain." RM has characterized this area as "grassy savannah" to be reseeded with upland plants. This upland area should only receive credit for a 50' wide buffer area to protect aquatic resources which is consistent with other areas on SCR and South SCR not bordered by agricultural fields.

RM did not respond to the Corps' request for the buffer width and acreage calculated for the ephemeral tributary channels to the east of the agricultural field.

Comment 3

Corps Comment 2.2.2 (p. 3): *Please discuss the suite of watershed functions to be gained at Fullerton Ranch ("FR") which will result in a gain to the watershed.*

RM Response (pp. 3-5): *Fullerton Ranch occurs in the Avra Valley Sub-basin, which includes the Altar and Avra Valleys. Sixty-six percent of the private land within the valley is grazed. Most of the land is contained within the Buenos Aires National Wildlife Refuge and 12 large ranches, eleven of which conduct active grazing. Estimated livestock stocking rates in the Altar Valley were as much as ten times above current recommendation from the late 1880's through the early 1900's (Sayre 2007).*

In 2008 a Rapid Watershed Assessment was conducted in the Altar Valley portion of the Sub-basin, where Fullerton Ranch is. Concerns that were identified within the watershed included (USDA 2008):

• Rangeland stability
– Excessive soil erosion has occurred within the watershed, removing necessary soil, nutrient, and organic matter from uplands and depositing them into downstream areas.
– The excessive soil erosion has led to sedimentation levels that have altered hydrologic characteristics within the watershed and have altered flood behaviors and severity.
– Excessive runoff from reduced infiltration and retention in upland areas has led to increased peak discharge rates in downstream areas that enhance flood severity and damage.

• Aquifer overdraft
– The Sub-basin has seen a significant reduction in groundwater levels in the downstream areas as the basin nears the urban area of Tucson. (ADWR 1981). The Fullerton Ranch area is directly upstream from the areas that have seen the most drastic reductions in groundwater levels.

• Habitat Fragmentation
– Habitat fragmentation resulting from anthropogenic activities, such as range fencing, have further degraded the system.

The degradation within the Altar Valley illustrates the importance of mitigation and restoration efforts within the watershed, which can have the following effects.

• Rangeland Stability
– The removal of grazing from the upland headwater area encompassed by Fullerton Ranch will improve upland vegetation which reduces erosion and sediment levels reaching the receiving waters within the watershed.
– Increased rangeland health will also reduce overland peak flows that are responsible for

damaging flood flows and will reduce sediment loads delivered to downstream waters.

• Aquifer Depletion
– Within arid southern Arizona, groundwater aquifers are typically recharged through mountain front areas and through channel infiltration. Restoration of natural conditions to upland and headwater systems will provide an increase to the groundwater recharge in the sub-basin. Further restoration or enhancement of upland areas and headwaters, including Fullerton Ranch, that supply recharge to this area will continue to improve recharge and could eventually lead to stabilization or an increase in groundwater levels.

• Habitat Fragmentation
- Removal of the large parcel of Fullerton Ranch from future anthropogenic improvements, removing grazing, and making use of wildlife friendly fencing will reduce the amount of habitat fragmentation present within this watershed.

EPA Comment: RM presents a general assessment of the Rapid Watershed Assessment (USDA 2008) which is focused on a geographic area much larger than FR. What is needed is a site specific assessment of existing functions at FR and improvement to each function supported by ***measurable/quantifiable*** metrics directly attributable to each of the proposed management actions. RM has not provided a measurable framework for how each of their proposed mitigation activities will result in improvement of specific functions on FR. General qualitative descriptions as presented by RM are of little utility in determining the actual functional gain of their proposed mitigation actions on FR. Again, RM should have discussed how individual mitigation measures resulted in measurable/quantitative improvements in functions on FR. Without this information, it is not possible to assign meaningful or scientifically justified mitigation credit to their proposed management actions.

Comment 4

Corps Comment 2.2.4 (p. 5) : *What is the timeframe associated with having the Managed Underground Storage Facility("MUSF") at Pantano Dam to be approved by the Arizona Department of Water Resources ("ADWR")?*

RM Response (p. 5): *An MUSF is an underground storage facility, the permits for which are governed by Arizona Revised Statutes (A.R.S.) §§ 45-801.01 et seq. Specifically, A.R.S. § 45-871.01 governs the procedure for application and permit issuance. It provides the following timeframe guidance. Upon filing an application, ADWR will endorse it and within 15 days post the application on the ADWR website. ADWR will conduct a review of the application within 120 days to determine completeness and correctness. If determined incomplete or incorrect, ADWR will notify the applicant and the review period is extended by 15 days commencing after the requested information is supplied. Once the application is determined complete and correct, ADWR will publish newspaper notice and provide other required notices of the application 15 days. The notice is published one a week for two consecutive weeks and interested parties have until 15 days after the last notice in which to file written objections. In appropriate cases, including those in which an objection is filed, ADWR may hold an administrative hearing before issuance of the permit. The hearing will be scheduled not more than 90 days after the close of the objection*

period. If a hearing is not held, ADWR will issue the permit within 6 months from the date of first publication. The applicant of any person who filed a proper objection may seek judicial review of the grant or denial of the permit. Considering these time frames, and typical proceedings on an application for an underground storage facility, the administrative process usually takes approximately 12 to 18 months. If judicial review is sought, this may add an additional year to the process, or longer if judicial appeals are taken.

EPA Comment: Please refer to previous EPA comments to the Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see p. 13-14 of attachment) for additional information regarding recovery of water for grant, gift, sale, lease, or exchange through long-term credits and additional authorization through Pima County.

Comment 5

Corps Comment 2.2.4 (p. 5): *To what extent will the water discharged to the MUSF "infiltrate the subsurface and recharge the alluvial aquifer"? What would be the quantitative extent of the functional gain? How would this be verified, monitored, and performance standards established? Please verify (page 13) from which water right the MUSF would be dedicated.*

RM Response (pp. 5-7): *Recent studies have shown the value of ephemeral drainages for recharge of regional aquifers. Levick, et al (2008) note that mountain-front recharge "is considered to be the most significant form of ground-water recharge in arid and semi-arid regions, with ephemeral stream channel recharge providing a significant portion in these climates." EPA (2013) similarly recognizes the recharge value of ephemeral streams, noting that, "[i]nfiltration is especially significant in arid, semiarid, and karst river networks, where water in intermittent and ephemeral streams recharge groundwater aquifers."*

It is anticipated that, given the current base flow discharge (approximately 0.5 cubic feet per second [cfs]) coupled with the extent of subsurface alluvium (Huckelberry and Letcher 2009), the discharge to the MUSF will infiltrate rapidly and the vast majority of the flows discharged will infiltrate to the subsurface.

The amount of surface water that is recharged to the aquifer is equal to the amount discharged minus evaporation and evapotranspiration. The amount of surface water discharged will be known because the discharge to the MUSF will be metered. To estimate evapotranspiration and evaporation, the type and area of vegetation associated with the discharge will be measured every June (by onsite evaluation of the mitigation parcel and aerial photo interpretation of downstream properties) and, at the same time, the area of discharged water on the surface will be measured. The annual evapotranspiration and evaporation will be calculated using the methods used in USGS Report 96-4021: "Infiltration of Wastewater Effluent in the Santa Cruz River Channel, Pima County, Arizona." The methods require percent of annual daytime hours, mean monthly temperature, mean monthly humidity, monthly pan evaporation, and area of broad vegetation type. If pan evaporation is not available, historical averages from the Western Regional Climate Center will be used (www.wrcc.dri.edu/htmlfiles/westevap.final.html).

The modeled long-term average annual reduction in stormwater flows to Barrel and Davidson canyons (as measured at the USGS gage at the SR 83 bridge (USGS Gage 09484580) is approximately 242 acre-feet per year. This is based on a modeled preconstruction average annual flow volume of 1,404 acre feet per year (FEIS p. 435, Table 94).

It should be noted that the baseline flow volume modeled at USGS Gage 09484580, i.e. 1,404 acre-feet per year, is higher than actual flow volumes recorded at the USGS Gage 09484580 given the conservative nature of the surface water models used to develop the estimate. For the flow volume calculations, Zeller (2012) utilized a particular flow model (Region 1 Seasonal Mean-Discharge Equation) specifically because it "produces average-annual runoff estimates that are larger than the average-annual runoff estimates" produced by a comparable model. This approach is typical for hydrologic calculations that are completed for engineering designs in order to provide factors of safety. However, recent data from the same gage (from 2009 through 2013) shows average surface water flow volumes ranging from 35 to 217 acre-feet per year, albeit with lower than average precipitation (between 8 and 16 inches, compared with the 18 inches used in the model [Zeller 2012]). Given the measured flow data, the actual long-term reduction in average annual stormwater flows is likely to be considerably less than 242 acre-feet per year.

The performance standard for the discharge of Cienega Creek surface flows to the MUSF is a 10-year average annual discharge of at least 242 acre-feet per year that is calculated (via methods described above) to either discharge to the subsurface (and thereby recharge the aquifer) or to support riparian vegetation.

The water for the MUSF would begin with the most senior priority right (BB-610.0002, 597.755 acre feet, 1908 priority), but would also include water (approximately 53 acre feet) from Certificate No. 665.0003 (total 477.545 acre feet, 1933 priority).

EPA Comment: We agree with RM's statement that the current base flow of 0.5 cfs will rapidly infiltrate into the alluvium below Pantano Dam with little ecological benefit. We also believe that the infiltration will occur over a short linear distance below the discharge point and that prior to infiltration a significant portion of this flow will either evaporate or be transpired by existing vegetation prior to reaching the alluvial aquifer. RM has not calculated the amount of discharged water that will be lost to evaporation and evapotranspiration even though they reference a quantitative method for providing such an estimate of water loss.

In RM's March 6, 2014 mitigation plan, they proposed 400 AFA as mitigation for project impacts. The April 1, 2014 plan proposes a reduction to 250 AFA. Based on the response above, the FHMMP now proposes 242 AFA averaged over 10 years. Clearly, RM recognizes declining base flow. In fact, RM states: *Given the measured flow data, the actual long-term reduction in average annual stormwater flows is likely to be considerably less than 242 acre-feet per year.* (p. 6). Therefore, RM is proposing as a measurable performance standard a base flow that is not realistic and by their own admission not likely to be met.

Section 5 Baseline Information

Comment 13

Corps Comment 5.2.3 (p. 9): *The Corps and EPA have repeatedly requested RM determine the current discharge from Monkey Spring. Has this information be obtained and, if so, please include it in the HMMP. What is the time frame required for ADWR to approve a "change of use" of the water right at Monkey Spring?*

RM Response (pp. 9-10): *The current discharge from Monkey Spring is not metered or otherwise measured and so Rosemont does not have this information. Monkey Spring is located on private property adjacent to but separate from the mitigation parcel and access is restricted. As noted in the HMMP, the certificated water right for Sonoita Creek Ranch is 75 percent of 785 acre-feet per annum (AFA) based upon measured spring discharge at the time of the Certificate of Diversion, or approximately 590.77 AFA. While Rosemont does not have measured flow data, there have been consistent releases of water from Monkey Spring to the site year-round.*

Flows from the spring support the two onsite ponds and the associated robust riparian vegetation surrounding the ponds. The ponds act as storage reservoirs for irrigation activities at Sonoita Creek Ranch, and the water levels in the ponds, particularly the southernmost pond, can drop significantly during periods of intense irrigation in the dry summer months (May and June). However, when managed for passive overflow, as proposed in the HMMP, the water levels in the ponds will be maintained with daily inputs from Monkey Spring and no drop in water level in the ponds is anticipated.

Beyond the ponds, surface water flows will only be used to support the estimated 2 to 3 acres of plantings associated with the designed overflow channel. The extent of these plantings will not be based on an assumed discharge, but rather will be based on a wetted perimeter test to be conducted following construction of the overflow channel system. The performance standard for this planting effort will be based on survivorship and vegetation growth. The performance standard for distance of overflow discharge will be removed in the final HMMP. Given that flows from Monkey Spring supported crop growth much greater than 2 to 3 acres in the recent past, the uncertainty associated with the success of this planting effort is minimal.

It is also worth noting that a relatively small proportion of the compensatory mitigation credits sought for Sonoita Creek Ranch relies on this water source. Of the total mitigation credit sought for Sonoita Creek Ranch, 6 acres are associated with the ponds and 2 to 3 acres with the overflow channel and associated riparian vegetation.

It is not anticipated that a severance and transfer for the Monkey Spring water right will be required because the place of use on Sonoita Creek Ranch will be maintained. If required, an application for a change in use of surface water may be filed with ADWR. It is governed by A.R.S. § 45-156(B) and the time frame for review by ADWR is governed by Arizona Administrative Code (A.A.C.) R12-15-401, Table A(6). That rule provides for an administrative review period of 30 days, and a substantive review period of 375 days, for an overall review period of 405 days. Those

time frames may be extended by a determination that the application is incomplete or incorrect, and may also be extended if an administrative hearing is held.

EPA Comment: Rosemont cannot receive mitigation credit for the proposed ponds and the overflow channel in absence of confirmation of the amount of water currently available from Monkey Spring. EPA understands that the flow has not been measured from Monkey Spring since approximately 1973. It is highly uncertain whether Monkey Spring currently produces the full water allocation as described in the Certificate of Water Right from ADWR, and whether available water is sufficient to support wetlands at SCR. An affidavit by a previous owner, Raymond Rich, stated Monkey Spring flowed at 1100 gallons/ minute = 1,774 AFA in 1966. The current estimate indicates a drastic decline in the amount of available water since 1966. A certified water engineer must measure flow in order to ensure the amount of water available for mitigation purposes. Given natural drought, climate change, and potential future mining in the watershed, it is uncertain whether flows from Monkey Spring are sustainable. There are anecdotal accounts of local wells drying in the area in response to drier climatic conditions.

RM cannot determine with any certainty the amount of overflow channel and associated riparian vegetation to be supported by Monkey Spring. RM notes: *The extent of these plantings will not be based on an assumed discharge, but rather will be based on a wetted perimeter test to be conducted following construction of the overflow channel system.* (p. 9). RM speculates that Monkey Springs currently irrigates crops greater than 3 acres in size and therefore can provide sufficient water for the overflow channel and associated vegetation. This is not comparable as the ponds can no longer be drained to irrigate crops; the ponds are proposed as mitigation for ESA and 404 purposes and therefore, water levels must be maintained.

Please refer to previous EPA comments to Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 requiring approval by ADWR (see p. 10-11 of attachment). Temporal loss of waters could be significant due to the lengthy and inherently risky ADWR approval process. Despite repeated requests by the Corps and EPA, Rosemont has not provided documentation from ADWR confirming the process for water use approval.

Section 6 Determination of Credits

Comment 15

Corps Comment 6.1.1.1 (pp. 10-11): *There is little evidential data which defines the "...previous braided channel system that existed within the Sonoita Creek floodplain prior to the channelization of Sonoita Creek into its current configuration". Therefore, the "reestablished floodplain system" cannot be designed to replicate an unknown. Please see our additional comments below regarding the SCR channel design.*

RM Response (p. 11): *The constructed channel design has been revised based on Corps comment. The revised design and associated hydrological report are provided in* ***Attachment B.***

EPA Comment: Please refer to previous EPA comments to Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see attachment). Specific comments relevant to the design

of the Constructed Channels at SCR and South SCR pertaining the *braided channel system* and the risks associated with the proposed channel design plan are presented on pp. 3-7. We believe that the modified channel design presented by RM still relies on the construction of a sinuous and braided system of channels and tributaries that may never have occurred on SCR or South SCR, or are not likely to flow at a frequency predicted by the modeling.

Comment 16

Corps Comment 6.1.1.1 (p. 11): *Please provide acreage of Waters of the U.S. ("WUS") associated with the 5-year/24-hour flood event. Please provide verification of the statement "Review of recent aerial photography shows the width of the Sonoita Creek floodplain ranging from approximately 900 to 1,500 feet in the vicinity of the Sonoita Creek Ranch mitigation site". Where is this location, has it ever been disturbed, and if not, can it be used as a better template than Big Casa Blanca Wash? What is the date of ADWR records which indicate the depth of the alluvium? How were these measurements obtained?*

RM Response (p. 11): *The acres of WUS associated with the redesigned constructed channels at Sonoita Creek Ranch, based on three different flood events, are provided in* ***Table 1****, below (see* ***Attachment B****).*

The estimate of the Sonoita Creek floodplain width was based on the geomorphology of Sonoita Creek on and near the mitigation parcel, and the assumed floodplain prior to development of SR 82 and the agricultural field, and largely reflected by the FEMA-mapped 100-year floodplain (Figure 10 in the HMMP). As such, this area does not provide a better template than Big Casa Blanca Wash.

The depth of alluvium at Sonoita Creek referenced in the HMMP was derived from a review of four ADWR well logs for wells that were completed in the Sonoita Creek alluvium between 1981 and 2008. The relatively broad range of reported alluvial thickness (20 to 300 ft) is attributable to the vague lithologic descriptions provided in the well logs.

EPA Comments: In Table 1 of the FHMMP, RM presents the areas of waters based on the 5, 10 and 20-year, 24-hour design discharge. The OHWM should be based on the 2-5 year return flow as this frequency range best reflects the location of the OHWM for most similarly-sized ephemeral streams in the arid Southwest. As previously noted, we question whether the 5-year return flow in Sonoita Creek is of sufficient magnitude to allow flows to enter the Restored Channel.

RM noted the depth of alluvium at SCR ranges between 20-300 feet based on data from only four wells. This wide range in alluvium depths indicates high variability in depths within a relatively small floodplain area. Additional soil cores would need to be drilled throughout the SCR floodplain to adequately characterize the depth of alluvium. A clear understanding of the depth of alluvium is critical for understanding channel stability and whether alleged improvements in floodplain functions associated with the restoration will be successful. In addition, RM proposes to excavate and remove 405,000 cubic yards of alluvium from the floodplain to allow construction of channels on SCR and South SCR. The removal of such a large volume of alluvium in the absence of information on the current depth of alluvium increases the risk that the proposed channel

construction will not be successful or function as proposed. We question the suitability and viability of a stream mitigation project that requires the excavation and removal of 405,000 cy of natural floodplain alluvium in order to implement the mitigation. This is the type of risk that the 2008 Mitigation Rule seeks to avoid.

In addition, the FHMMP includes the removal of approximately 405,000 cubic yards of material from the proposed Sonoita Creek mitigation site. The applicant indicates that this material would be disposed of at the Rosemont mine site. It is unclear how this material will be used or where it will be placed at the mine site. EPA assumes that it would be considered soil suitable for use as cover material during reclamation activities. This material would presumably need to be transported to the Rosemont Mine site via highway 83. It would therefore need to be placed upon street-legal vehicles. The average 53' tractor trailer has a maximum dimension of approximately 150 cubic yards. Assuming that such a trailer could be loaded to capacity, the 405,000 cubic yards Rosemont proposes to remove from Sonoita Creek Ranch would fill 2,700 trailers. The Final EIS indicates that the mine site would receive between 25 and 50 daily shipments of materials/equipment (depending on mine phase and weekday/weekend) (Table 169, 170; page 942). Assuming that the 2,700 fully loaded trailers are delivered individually and depending upon the timing of the removal and transport of this material, the volume proposed for shipment from Sonoita Creek Ranch to the mine site represents a moderate to significant deviation from the traffic analysis provided in the EIS. In addition, it is not clear what effect these truck trips may have upon air quality along the highway 83 corridor. As discussed in the EIS, emissions associated with the Rosemont mine are anticipated to produce visibility impairments in excess of established regional haze thresholds for a number of Class I areas. Further analysis is needed to fully understand the potential environmental impacts of this action.

Comment 17

Corps Comment 6.1.1.3 (p. 12): *What sensitive species will benefit from the enhancement of the ponds?*

RM Response (pp.12-16): *On October 30, 2013 a final biological opinion (USDI 2013) was published with respect to Rosemont's proposed activities. The biological opinion included definitions of the potential benefits to select special status species listed under the Endangered Species Act (**Table 2**). The Gila chub (Gila intermedia) and the Gila topminnow (Poeciliopsis occidentalis) will benefit from the redesign of the ponds creating new or improved habitat and will benefit from the removal of nonnative predators (USDI 2013). The Chiricahua leopard frog (Lithobates chiricahuensis) is expected to benefit from the enhancement of available habitat, through the implementation of barrier fencing and the removal of nonnative predators (USDI 2013). Also, if the conditions within Sonoita Creek Ranch following restoration efforts are deemed appropriate, the endangered Huachuca Water Umbel (Lilaeopsis schaffneriana var. recurva) will be considered for establishment within the Sonoita Creek Ranch site.*

*Additionally a list has been compiled using the Arizona Game and Fish Department's online HabiMap Arizona website (**Table 3**; AGFD 2013). The list is composed of three separate queries conducted within the HabiMap Arizona tool. The first query consists of the Species of Greatest Conservation Need, which encompasses the species included within the Arizona State Wildlife*

Action Plan. The second query utilizes Arizona's Heritage Data Management System which is a compiled list of location records for special status species throughout Arizona. The third query is based on the Arizona Breeding Bird atlas. This query lists the potential and confirmed breeding status for avian species within the state of Arizona. The breeding bird query was then cross referenced with the avian species protected under the Migratory Bird Treaty Act and species were removed that were not present under this law.

This list is not meant to suggest that all of the species contained within are present within or will benefit from the ponds, or that the list captures all of the special status species that may be present. The list consists of all the special status species that have been detected in the vicinity of Sonoita Creek Ranch or have been modeled to potentially occur there based on characteristics determined by AGFD and contained within the HabiMap Arizona online database. The list is a representation of the special status species that have the potential to utilize any number of beneficial functions or features provided by the ponds and habitat resultant from the presence of the ponds.

EPA Comment: RM states the Gila chub and the Gila topminnow will benefit from the redesign of the ponds creating new or improved habitat and from the removal of nonnative predators (USDI 2013). They also state the Chiricahua leopard frog is expected to benefit from the enhancement of available habitat, through the implementation of barrier fencing and the removal of nonnative predators (USDI 2013). Due to new information regarding pond construction and uncertainties about hydrology, the USFWS is considering whether to reinitiate consultation on the endangered species to determine, in part, whether these ponds will benefit the listed species.

In addition, EPA maintains this proposed pond mitigation is a requirement of the USFWS Biological Opinion and should not be double-counted as 404 mitigation. Our position is supported in the Preamble of the 2008 Mitigation Rule: "Resources that are restored, established, enhanced or preserved to satisfy the requirements of other federal programs may not also be used for compensatory mitigation for DA permits." (p. 19608). The Preamble does note a consolidated project can be used to satisfy more than one set of requirements provided the same resource is not double-counted. In this case, the proposed ponds and adjoining wetlands would be used as frog habitat and therefore, should only address the requirements of the conservation measures pursuant to the Endangered Species Act.

In Table 3, RM provides a list consisting of all the special status species that have been detected in the vicinity of Sonoita Creek Ranch, or have been modeled to potentially occur there based on characteristics determined by AGFD and contained within the HabiMap Arizona online database. RM goes on to suggest that the list is a, *representation of the special status species that have the potential to utilize any number of beneficial functions or features provided by the ponds and surrounding habitat resultant from the presence of the ponds.* (p. 12). Table 3 is a general list of species potentially found in the vicinity of SCR. Most of these species would not be expected to be found in or adjacent to the ponds, or benefit directly from the ponds.

Comment 19

Corps Comment 6.1.2.1 (p. 17): *What is the specific suite of functions to be improved at FR by removal of the five earthen dams?*

RM Response (p. 17): *The removal of the earthen dams at Fullerton Ranch will reestablish natural ephemeral flows in three of the onsite drainages. Functions to be improved by this effort include:*

- *Sediment transport - sediment important to downstream receiving waters will be discharged downstream rather than be retained in the impoundments.*
- *Hydrologic connectivity - similar to the sediment transport function, removal of the earthen dams will promote discharge of ephemeral storm flows to the downstream receiving waters, rather than retention of flows in the impoundments.*
- *Organic carbon export - similar to the sediment transport function, removal of the earthen dams will promote the export of organic carbon to downstream systems, rather than retaining the organic material in the impoundments.*
- *Habitat connectivity - while the onsite impoundments provide habitat for wildlife, including seasonal surface water, removal of the dams and associated access roads will promote the reestablishment of xeroriparian habitat corridors through the affected drainages.*

EPA Comment: The *reestablishment* of functions at FR claimed by RM will also result in **impacts to existing functions** and will provide little, if any, measurable functional lift to existing waters. The expected functional gain has not been quantified in meaningful way. Please refer to previous EPA comments to Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see p. 12 of attachment). We also have these additional comments: The removal of the earthen dams at FR will eliminate the sediment and organic storage functions provided by the dams. The dams already pass water once their storage capacity is exceeded so hydrologic connectivity already exists. Finally, the removal of these relatively small dams will do little to promote habitat connectivity and actually may reduce wildlife use of these drainages as the ponds currently store water and, as such, act to attract and function as habitat for wildlife. For example, RM is proposing to build water tanks and holding ponds with similar functions to the ponds at FR **as habitat mitigation** at other locations within the Cienega Creek watershed.

Comment 20

Corps Comment 6.1.2.1 (p.18): *Tables 2-4 We request citations and/or rationale to support the levels of function (None, Low, Medium, High) identified for each type of function for each site. While many of them might seem intuitive or obvious to the preparers, justification is needed. For example, headwater streams generate substantial sediment and are important contributors of surface water flows and sediment to downstream receiving waters. It is not clear why they were scored "Low" for Sediment Transport and Hydrologic Connectivity (for comparison, re-established ephemeral washes at Fullerton Ranch were scored "Medium" for both functions; yet according to Section 6.4.2, "The Washes at Fullerton Ranch are similar in nature to the smaller washes at the impact site. That is, they are ephemeral, relatively high gradient headwater streams that support xeroriparian habitat and little alluvium."). Also, while channel re-establishment on Sonoita Creek's historic floodplain would increase riverine functions in the area, it is uncertain whether the levels could ever achieve or be assessed as "High" performance. In fact, there have been many stream reestablishment or establishment projects that have had limited success, as discussed in the Preamble to the 2008 Mitigation Rule. "Medium" performance levels are more*

realistic to expect at this location, considering the cautionary tone of the Mitigation Rule regarding establishment and reestablishment projects and the highly engineered, multi-braided channel system design proposed for this disturbed historic floodplain. Flood/Water Storage, for example, depends partly on macro- and micro-topographic complexity/relief (using a peer-reviewed water/wetland assessment method such as the Hydrogeomorphic ("HGM") Approach for riverine wetlands/waters), which both appear to be very limited in the plans of the overbank and pilot channels provided in the HMMP. Similarly, the engineered nature of the established overflow channel, which would be underlain with PVC liner to inhibit vertical movement/subsurface loss of water, would limit its hydrologic connectivity and groundwater recharge potential along its length (i.e., "Medium" scores for these two functions do not seem supportable given the restricted subsurface flow the lining is meant to ensure). The intent of the design would be to support vegetation along the lateral edges of the channel and to convey water to the downstream reestablished channel. At Pantano Dam, while discharging additional water below the dam has the potential to benefit the aquifer or provide subsurface flow through the wash, as has been discussed in our meetings and in the documentation, there is a hydraulic sink downstream of the dam. As such, it is highly uncertain whether the additional water would provide surface flow. Considering hydrologic connectivity includes surface and subsurface flow capability, the "High" score for this function does not appear supportable.

RM Response (pp. 18-21): *In section 6 of the HMMP for the Rosemont Copper Project, an analysis was included that compares the functions associated with the headwater washes and the large low-gradient washes at the Rosemont Mine (RM) to the post-restoration functions provided by the various mitigation actions Proposed at Sonoita Creek Ranch (SCR), Fullerton Ranch (FR) and Pantano Dam (PD). Tables 2-4 in the HMMP summarize the results of this analysis.*

For each of the functions and associated benefits discussed below, the factor(s) that affect the capacity or degree to which a resource performs that function has been identified. These factors provide a way to qualitatively assess the potential for each mitigation feature to perform the identified function. For example, the capacity to which a stream provides the benefits related to the Subsurface Flow function is a Rosemont Copper Project HMMP Corp File No. SPL-2008-00816-MB Response to Comments Addendum 19 direct result of the amount and duration of water conveyed by the stream and the volume of porous sediments beneath the stream. Therefore a stream that has the potential to convey more water, for a longer duration over deep sediments has higher potential to provide benefits related to subsurface flow than as mall ephemeral headwater stream underlain by bedrock.

• ***Surface Water Storage.*** *Long and short-term surface water storage replenishes soil moisture, provides seasonal ponded areas for nutrient transformation, provides seasonal habitat for aquatic organisms and amphibians, reduces peak flood discharges and can improve downstream water quality through temporary retention (Smith et. al. 1995). The ability of a stream to provide this function is influenced by the surface area exposed to flows, the gradient of the stream, and the presence of off-channel storage within the floodplain. Therefore, the volume of potential storage is indicated by the presence of an active floodplain and depressional features within the floodplain (Fischenich, 2006). In addition, pool features within the stream itself can provide for in-channel storage. For these reasons, among others, smaller channels with narrow floodplains and steep gradients often have lower surface water storage potential compared to larger channels*

(Levick et. al. 2008).

• ***Subsurface Flow.*** *The storage and flow of subsurface water in ephemeral streams maintains biogeochemical processes through alteration of aerobic and anaerobic zones, soil moisture, riparian habitats, and animal biodiversity (Fischenich, 2006; Smith et. al. 1995). These processes occur in the hyporheic and parafluvial zones (Levick et. al. 2008) of streams where subsurface moisture interacts with or is supported by groundwater and the capacity to perform this function is dependent on the volume of substrate in these zones. Headwater streams with shallow depths to bedrock have lower capacity to perform this function than do streams with moderately deep hyporheic/parafluvial zones.*

• ***Energy Dissipation.*** *The composition of channels and floodplains of streams affect the level of energy of the water that moves through that stream. Lower stream energy typically results in slower velocities which reduces downstream particulates (Smith et. al. 1995), prevents excessive erosion, and maintains water quality (Levick et. al. 2008). The energy of water in a stream is determined by the slope, geometry and roughness of the channel. Headwater streams with high roughness can reduce energy; however, in ephemeral desert streams without substantial bedrock grade control, erosive flows can occur. Streams with lower gradients, more sinuosity, and larger floodplains can better dissipate stream flow energy over a larger area and act as depositional environments.*

• ***Groundwater Recharge.*** *The recharge of groundwater systems by streams maintains groundwater dependent habitats such as riparian habitats and base flows (Smith et. al. 1995) in groundwater fed streams and wetlands within the same groundwater basin. Groundwater recharge is a measure of the amount of surface water transmitted to deep groundwater storage basins. The amount of recharge is dependent on the porosity and depth of the substrate underlying the wetted surface area of streams as well as the stream gradient. Groundwater recharge is highest in mid catchment or "mountain front" recharge areas (Levick et. al. 2008), as lower reaches often have rates of evapotranspiration and higher reaches are bedrock constrained.*

• ***Sediment Transport.*** *Appropriate sediment transport is important for maintaining natural sediment regimes and disturbance processes throughout the watershed as well as promoting appropriate rates of erosion and deposition for downstream channel forms (Fischenich, 2006). Sediment transport capacity is controlled by sediment mobility, flow magnitudes and flow frequency (Fischenich, 2001). While headwater streams collectively provide important sediment sources for downstream waters (Levick et. al. 2008) individually their capacity to transport sediments is relatively small due to the immobility of their sediments (e.g. bedrock) and lower flow volumes. Lower gradient streams store sediment in low to mid flow events; but can be significant sources of sediment during high flow events. For this reason, such streams can be an important buffer in the storage and transport of sediment throughout the river system.*

• ***Biogeochemical.*** *Biogeochemical functions in ephemeral streams include cycling, removal, detention, and export of elements, compounds and particulates (Levick et. al. 2008; Smith et. al. 1995). The capacity of a stream to perform these functions is based largely on organic matter inputs and water-sediment contact (redox potential). The greater the organic inputs, water sediment contact surface, and water-sediment contact time (Fischenich, 2006) the greater the*

capacity for biogeochemical processes to occur. Small headwater streams concentrate and store nutrients, while complete removal of nutrients (e.g. nitrogen) often relies on anaerobic conditions dependent on prolonged moisture (Levick et. al. 2008). Nutrient "spiraling" is a process associated with streams during which nutrients are consumed and regenerated for reuse after being displaced downstream and therefore is dependent upon an intake stream system (Webster and Patten 1979). Particulate detention is a physical process that is dependent on the ability of a stream to store particulates in depositional areas (Levick et. al. 2008; Smith et. al. 1995), such as a floodplain. It is expected that nutrient processing increases with greater contact with sediments which occurs in lower gradient streams. In addition, pollutants are often retained in the lower gradient stream beds.

• ***Organic Carbon Export.*** *The export of organic carbon enhances the deposition and mobilization of metals, supports biogeochemical processes (Smith et. al. 1995) and is the primary source of energy for downstream foodwebs (Levick et. al. 2008). Headwater streams and floodplain channels are the most important sources of carbon as they store large amounts of carbon from plant matter which are transported to downstream waters during storm events (Fisher and Likens 1973). Much of this carbon is derived from upland and riparian habitats adjoining the stream. Given the greater edge effect associated with headwater streams, they are important sources of organic carbon that is then deposited in lower gradient streams.*

• ***Habitat Connectivity/ Structure.*** *Streams that support significant riparian habitat maintain plant and animal communities that are more diverse and are distinct from surrounding uplands and provide corridors promoting regional biodiversity (Levick et. al. 2008; Fischenich, 2006; Smith et. al. 1995). These benefits are largely a product of increased cover and nutrient sources. Species diversity is determined by depth to groundwater, watershed size, as well as soil, elevation and climate conditions. In smaller streams, species composition and diversity is similar to the surrounding uplands and becomes more distinct and more diverse with increasing availability of water and flood intensity (Levick et. al. 2008).*

Using these functions, an assessment was made for each of the mitigation sites in comparison to the impact areas at the Rosemont Mine project site. Two types of ephemeral streams occur within the project site. The first are tributaries to Barrel and Wasp canyons that are small first order drainages with steep gradients, near surface bedrock, and little access to an adjoining floodplain. These tributaries drain into larger wash systems typified by those within Barrel and Wasp canyons. These are lower gradient ephemeral washes with vegetation densities that are greater along the edges of the washes and consisting of drier xeroriparian species.

For each restoration activity within the mitigation areas, the functions that will be achieved with the restoration activity were evaluated in relation to the function within the impact areas that will be lost with development. This provides a qualitative evaluation of the equivalency, improvement, or loss of function associated with the specific mitigation measures. Tables summarizing this evaluation are provided in ***Attachment C. Table 2*** *replaces Table 2 (page 36) in the HMMP;* ***Table 3*** *replaces Table 3 (page 38) and* ***Table 4*** *replaces Table 4 (page 39). Following each Summary Table, the rationale for each function is provided based on the criteria described above.*

It is expected that for those comparisons where the majority of the functions compared result in increased or equivalent function from existing condition, the mitigation credit ratio associated with that action will be lower. Whereas for actions in which functions may primarily decrease, mitigation credit ratios will be higher and more acreage of that habitat will be necessary to replace lost functions. For example, at Sonoita Creek, re-established floodplain channels result in an increase in many functions and therefore the credit ratio that is associated with that action is 1:1, whereas the re-established riparian habitat has a lower benefit to the evaluated functions and therefore the mitigation ratio is 5.3:1. Generally, the functional evaluation provides a basis for assessing the appropriate mitigation ratios; however, since it is a qualitative approach, it is difficult to link them quantitatively. However, the functional evaluation is based on the scientific understanding of how ecological processes occur within desert ephemeral streams and provides an objective measure on which to establish mitigation ratios. Table 5 of the HMMP is consistent with the outcome of the functional evaluation.

Revised mitigation ratio setting checklist worksheets are included with ***Attachment C.***

EPA Comment: RM provides a long list and description of functions provided by waters at the mine impact and proposed mitigation sites. Please refer to previous EPA comments to Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see p. 11 of attachment). These previous comments address flaws in the functional assessment method and logic, several of which are applicable to RM's current assessment.

We would like to reiterate several points that we believe call into question the validity of conclusions made in RM's current assessment of functions: (1) It is not scientifically valid to directly compare functional gain and loss between the two different stream classes (*e.g.*, 1st and 2nd order vs. 4 and 5th order of riverine waters). While different stream classes of water may perform a similar suite of functions, they perform these functions differently, and therefore any meaningful comparison for mitigation purposes must be made within similar classes of waters. This is a basic principal that must be considered when conducting a functional assessment methodology. RM fails to adequately recognize and apply this important principle. The result is that the headwater streams at the mine impact site are functionally undervalued when compared to the broad, low-level floodplain site at SCR. In lay-persons terms, you can't compare apples and oranges when assessing functions for mitigation purposes; (2) The proposed mitigation at SCR is out-of-kind. Please see EPA comments on p. 2 of attached April 9, 2014 comments; (3) RM emphasizes that the SCR floodplain is much broader and is underlain by more alluvium when compared to the mine impact site, and therefore SCR will provide increased functional gains for several functions as compared to the mine impact site. Again, RM makes inappropriate comparisons between two very different classes of waters; waters in very different hydrogeomorphic positions in the landscape which receive different amounts of rainfall. Also, RM fails to acknowledge that the mine site drainages are part of an interconnected stream network totaling over 100 acres of waters that function together **as a water source area** which maintains functions critical to the health of the broader Cienega Creek watershed. The mitigation proposed at SCR lies within a very different hydrogeomorphic setting, with lower precipitation, than the mine site and will do nothing to offset mine impacts to the Cienega Creek watershed (note: groundwater at SCR moves toward Patagonia, **not** the Cienega Creek watershed); and (4) RM

consistently undervalues the functions of the streams at the mine impact site and overvalues the level of functions for mitigation proposed at SCR, FR, Pantano Dam and within Davidson Canyon, with little scientific justification in support of their qualitative rankings.

Comment 21

Corps Comment 6.3 (p. 21): *We request RM summarize numerically whether a net loss in aquatic resource surface area would occur, comparing the project impacts and the compensatory mitigation. Qualitative statements have been provided, but numbers are needed to justify them.*

RM Response (pp. 21-22): *As noted in the HMMP, the total area of potential Waters lost as a result of the Rosemont Project is 40.4 acres. Although Rosemont is also required to mitigate for 28.4 acres of downstream impacts, these impacts result only in a reduction in function; the area of potential Waters remains unchanged. The mitigation package includes reestablishment of between approximately 53 acres of Waters (assuming the 10-year flood event is used to define OHWM) at Sonoita Creek Ranch through the constructed channel in the Sonoita Creek floodplain, and 2.4 acres of Waters at Fullerton Ranch through the removal of the earthen dams. As such, the mitigation package provided by Rosemont will result in a net increase in Waters.*

EPA Comment: Assuming the 5-year, 24-hour flood event, RM is proposing the reestablishment of 46.29 acres, not 53 acres, of waters. This is approximately a 1:1 replacement-to-loss ratio and, as such, is grossly deficient as mitigation for the direct loss of 40.4 acres of high-functioning waters at the mine impact site. RM continues to provide only qualitative statements comparing project impacts to compensatory mitigation. RM does not provide a table similar to that provided in earlier drafts of the HMMP clearly summarizing project impacts and proposed mitigation.

Comment 22

Corps Comment 6.4.1 (p. 22): *The proposed mine site is, in fact, a substantial wildlife corridor which is well documented within the final Environmental Impact Statement ("EIS"). In addition, the proposed mine site lies within Pima County's "Important Riparian Areas" designation. Please revise the HMMP to reflect this information.*

RM Response (p. 22): *While the proposed mine site and the riparian areas contained within are likely used by wildlife for movement, they are located within an area defined as a wildland block (**Figure RC-2**; Beier et al. 2008). The designation is important; wildland blocks are large areas that are relatively unfragmented and contain little to no anthropogenic impedance to wildlife movement. Riparian corridors, like those associated with Sonoita Creek, are unique in that they provide refugia along disturbed areas (i.e. State Route 82) allowing for wildlife shelter, usage, and movement. They also potentially allow for lateral movement between two habitat blocks that are separated by open or disturbed areas.*

*As shown in **Figure RC-2**, Sonoita Creek is considered a wildlife corridor. Also, a defined section of the lateral wildlife linkage between the Patagonia and Santa Rita Mountains runs through Sonoita Creek Ranch (Beier et al. 2008). It is the refugia and opportunity for safe movement along with the connectivity between unfragmented areas that sets the Sonoita Creek riparian areas apart from those located within the proposed mine site.*

EPA Comment: Once again RM attempts to downplay the functional importance of the mine impact site as a regionally-significant, unfragmented wildlife corridor. This demonstrates RMs complete misunderstanding of the importance of the watershed setting at the impact site in determining the functional significance of these ephemeral streams. This is troubling and significant because RMs lack of understanding of the value to waters at the mine site influences their functional assessment of waters at the mine site when compared to the mitigation sites.

Section 7 Mitigation Work Plan

Comment 23

Corps Comment 7.1.2 (pp. 22-24): *Reestablishment of Sonoita Creek Floodplain*

Hydrologic Modeling - to provide a broader range for the estimated amount of WUS in the constructed channels in the Sonoita Creek floodplain, the 5-year, 24-hour storm event should also be used to estimate the amount of WUS in the constructed channels (currently the report only provides estimates for the 10-year, 24-hour storm and the 20-year, 24-hour storm as documented on Table 6 of Attachment 8 of the HMMP). In addition, the discharge in all the constructed channels associated with a 5-year, 24-hour event should be generated and discussed in the same detail in the HMMP (and Attachment 8) as the 10-year and 20-year, 24- hour events.

Channel Design -we have received little evidence Sonoita Creek or Big Casa Blanca Wash (which was evaluated to provide a template/parameters for channel re-establishment at Sonoita Creek) in this area ever supported a multi-braided channel system. The HMMP states such a system existed within the Creek floodplain prior to the creek's channelization, but we have not seen evidence of it. Minckley {1968) was primarily a faunal study and his statement regarding historic Sonoita Creek was "Prior to 1890, Sonoita Creek probably flowed through a broad, marshy floodplain in multiple channels or by seepage." We do not interpret this as meaning that Sonoita Creek, historically, was composed of a multi-braided channel system.

As such, we are concerned a multi-braided channel system would not be sustainable, free of future maintenance/modifications on the historic floodplain, and creating such a channel complex on this area could constitute an establishment/creation rather than a reestablishment/restoration project. The 2008 Mitigation Rule recognizes that establishment is a less preferred form of compensatory mitigation, with restoration identified as generally the "first option" pursuant to 33 CFR § 332.3{a)(2) because the likelihood of success is greater. We must evaluate the likelihood of success of the compensatory mitigation proposal, which is difficult to do with the information we have been provided and our on-site observations. While in the field on 4/2/2014, we did observe physical evidence of a higher-flow/secondary channel along both the northern and recently acquired southern portions of SCR. It appears Sonoita Creek, as with many stream systems in the arid southwest, supported and can continue to support a higher-flow or secondary channel through this historic floodplain area.

To address our comment/concern, we request RM provide credible evidence to us that the historic floodplain of Sonoita Creek through this area supported a multi-braided channel system similar

to what RM proposed in the HMMP, or determine if it is technically feasible to modify RM's proposed channel design to re-establish a single higher-flow/secondary channel through SCR that is joined by other tributaries and smaller watersheds from the east (and an overflow channel from pond 2) and by Smith Canyon in the southern part of the ranch. The original conceptual design submitted focused on a single-channel form (primarily) indicative that such an approach is technically feasible. Modifying the channel design to a single-channel form would entail eliminating the multiple "Constructed Secondary Channels" connected to "Constructed Channel 1" and perhaps altering the primary channel alignment somewhat from what is depicted in the HMMP figures. In fact, changing it to a single-channel form could afford more opportunity to allow the re-established channel to migrate laterally across the historic floodplain, as many natural streams tend to do in the southwest. While additional channels or braids could form over time from a single-channel form, we anticipate less uncertainty with respect to channel and system sustainability in allowing this to occur as a natural rather than engineered and constructed process.

If RM determines that proceeding in this way is technically feasible and will address our concerns for long-term stability, we request RM provide engineering documentation and revise the HMMP to support this change. In addition, if RM determines it is technically feasible, it may widen the current channel design (the overbank channel and/or the pilot channel) to ensure the channel has sufficient capacity to convey the expected flows and to provide more opportunity to migrate laterally. We recognize that eliminating the "Constructed Secondary Channels" from the design would reduce the potential total area and length of stream WUS onsite. This loss could be offset partially by constructing additional surface water connections to Sonoita Creek.

Currently the surface hydrology for the constructed channel system relies on a single connection to the main-stem of Sonoita Creek, which is supplemented by surface flow from small tributaries to Sonoita Creek. During our discussions in the field on 4/2/14 and in the office on 4/3/14, RM's team seemed amenable to our suggestion to incorporate additional surface water connections between Sonoita Creek and its floodplain. Therefore, to ensure adequate surface hydrology for the constructed channels, the HMMP should analyze the potential benefits of additional connections to Sonoita Creek or provide a technical rationale explaining why additional connections to the main-stem would be problematic for the proposed constructed channel system.

While the goal is to offset losses of aquatic resource area and functions associated with project impacts, also of primary importance is maximizing the likelihood of compensatory mitigation success, including re-establishing a sustainable channel system in the historic floodplain that can be accessed at regular intervals by Sonoita Creek flows and which does not require future maintenance or modifications. Please note these are our suggestions based on our observations and review of available information, and RM will need to completely evaluate and determine if they are technically feasible of being successfully implemented. Any changes should be thoroughly noted and discussed within the HMMP.

RM Response (p. 24): *The constructed channel at Sonoita Creek Ranch has been redesigned to reduce the degree of braiding, as described by the Corps. A full discussion of the redesign, in the context of the comments provided here, is provided in* ***Attachment B****.*

EPA Comment: Although RM has redesigned the constructed channel at SCR to reduce the degree of braiding, the new design is still flawed and poses very high ecological risk. EPA has provided extensive comments on the risk and uncertainty associated with the proposed channel construction in comments to the Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see pp. 3-8 of attachment). Most of these previous comments are still valid. In addition to these previous comments we have the following additional concerns, below.

The modeled projected minimum flow necessary for water to enter the existing Restored Channel from Sonoita Creek at the upstream-most diversion point has been drastically reduced from 1,150 cfs to 200 cfs in the current FHMMP.[1] The FHMMP further concludes that the frequency of flows of 200 cfs will occur in response to less than the 2-year, 24-hour storm event. There is no discussion of the reasons for changes to previously modeled flow projections. Observations of the physical characteristics of the Restored Channel during our March site visit to SCR and review of aerial photography over the last 20 years indicates that the Restored Channel does not receive flows at anywhere near the frequency stated in the FHMMP. In fact, there is no physical evidence that the Restored Channel has received flows from Sonoita Creek in almost 20 years. That the return frequency of the modeled flows are not validated by the available on-site and aerial photographic physical evidence, indicates that the models have significantly overestimated the frequency at which the Restored Channel will receive flows from Sonoita Creek. One possible explanation for the lack of physical indicators of recent flow in the Restored Channel is that climatic shifts have reduced the frequency and amount of precipitation during the previous decade (it is well known that this region is within an ongoing decadal record drought) and therefore modeled streamflows may not accurately depict more recent rainfall trends. This is concerning because the stated ability of the proposed constructed channels to provide a suite of functions aimed at offsetting mine impacts is entirely dependent on an accurate understanding of streamflow. We believe that the risk that predicted flows will not occur as modeled is great.

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[1]The 04/01/2014 HMMP report by WET (p. 15) states (**emphasis added**):

Based on hydrologic analysis in the watershed, a peak flow of 1,500 cfs is expected to occur with a recurrence interval of slightly larger than the 2 year, 24-hour storm event. ***The HEC-RAS model for the channel system shows that at a discharge of greater than 1,150 cfs in Sonoita Creek, the Restored Channel at the upstream end of the constructed ephemeral channel receives water.*** *For discharges in Sonoita Creek below this level, flow only occurs in Sonoita Creek.* ***Flows of this magnitude occur relatively frequently, between the 2-year, 24-hour and 5-year, 24-hour storm events, as shown in Table 2.***

The 04/24/2014 HMMP report by WET (p. 16) states (**emphasis added**):

Based on HEC-RAS analysis, the existing low-capacity reach at the entrance road has a capacity of 1,500 cfs. Based on hydrologic analysis in the watershed, a peak flow of 1,500 cfs is expected to occur with a recurrence interval of slightly larger than the 2 year, 24-hour storm event, as shown in Table 3. ***The HEC-RAS model for the channel system shows that at a discharge of greater than 200 cfs in Sonoita Creek, the restored channel at the upstream end of Constructed Channel 1 begins to receive water.*** *For discharges in Sonoita Creek below this level, flow only occurs in Sonoita Creek.* ***Flows of this magnitude occur relatively frequently, less than the 2-year, 24-hour storm event, as shown in Table 3.*** *At discharges of 200 cfs, the diversion at Constructed Secondary Channel 2 is simulated to receive 18 cfs. Hydraulic modeling results presented in Appendix A demonstrate the discharges in the upstream portion of the Sonoita Creek Ranch only.*

We are very concerned with RMs statement that there may not be sufficient flows in Sonoita Creek to provide water to the Constructed Channel. RM states: *The challenge with tying performance criteria to flow events in ephemeral systems, particularly under the extended drought conditions that southern Arizona is currently experiencing, is that a flow event of a magnitude to extend through the constructed channels may take several years to occur,* ***and may not even occur within the 10-year monitoring period.*** (p. 38, emphasis added). This is a clear statement by RM that there is significant ecological risk associated with the proposed constructed channels. **Why should we accept mitigation that may only function periodically for the loss of high functioning headwater streams at the mine site that typically flow annually when it rains?** (note: headwater streams at the mine site receive significantly greater precipitation than SCR and therefore will provide functions more frequently than SCR).

RM continues to claim that the stated goal of the proposed mitigation plan is to create a natural, stable, floodplain system at SCR. However, the newly designed proposed constructed channels will still not be designed as self-sustaining, unconstrained, or naturally-functioning floodplain channels and so they will not provide the significant and lasting ecological benefits to the aquatic ecosystem. There remains a substantial ecological risk that they may fail to function as designed. The FHMMP (Appendix B: Wetland and Earth Technologies, *Conceptual Design for Ephemeral Channel Adjacent to Sonoita Creek*, April 24, 2014) states: *Lateral migration of the channel outside the graded boundaries or the occurrence of headcuts would be considered significant changes* (p. 23). RM further states: *…the performance standards for the constructed channel and the overflow channel will be as follows (**Attachment B**):…Lateral migration of the channel is contained within the constructed graded boundaries* (p. 38). Clearly, the goal of the constructed channel is to restrict any natural, lateral movement on the SCR floodplain; only the smaller pilot channel within larger constructed channel will be allowed to move. **As such, the proposed design is not fully self-sustaining or naturally functioning.**

We cannot overemphasize the importance of understanding with reasonable certainty the current and potential future behaviors of Sonoita Creek and the constructed channels prior to determining the adequacy of the mitigation (see EPA's comments to the Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see pp. 3-4 of attachment). Modelling and predicting streamflows is only one important parameter for understanding the likely behavior to a stream. There has been insufficient analysis to determine with reasonable certainty the current balance between sediment transport capacity and load. Successful channel restoration requires an understanding of sediment supply and other processes, not just copying channel form alone (*i.e.*, the Rosgen C Type channel proposed in the FHMMP).

We are similarly concerned that the construction of the proposed mitigation channels requires the excavation and offsite transport and disposal of 405,000 cubic yards of floodplain alluvium. This is a massive amount of sediment that is proposed for removal from the existing floodplain and there has been no analysis of the potential effects from this sediment removal on floodplain functions or channel behavior or stability.

Comment 24

Corps Comment 7.1.2 (p. 24): *Adaptive Management - the constructed channel system in the floodplain of Sonoita Creek is designed to accommodate the 100-year, 24-hour event; with a larger storm event, the constructed channels could exhibit lateral/vertical erosion and/or additional braiding. The adaptive management section of the HMMP must address whether the morphological channel changes associated with very large storm events will be allowed to remain in place or if the constructed channels will need to be repaired. If the constructed channels would need to be repaired then the long-term management plan should be modified to address the future need for repairs in the constructed channel system.*

RM Response (p. 24): *A discussion of adaptive management for the constructed channels is provided in the revised WET design report (**Attachment B**), and repeated here.*

During the course of annual and runoff event monitoring it is possible that changes are observed that could alter the functioning of the constructed channel system (e.g., a response to an extreme hydrologic event). Any significant changes will be quantified and documented and compared with the range of annual conditions monitored. Lateral migration of the channel outside the graded boundaries or the occurrence of headcuts would be considered significant changes. In consultation with the Corps, significant changes will be reviewed and a plan for repairs or modifications will be identified.

EPA Comment: In response to the Corps' request for information regarding Adaptive Management and Performance Standards, RM states, *Lateral migration of the channel outside the graded boundaries or the occurrence of headcuts would be considered significant changes* (p. 24), and L*ateral migration of the channel is contained within the constructed graded boundaries* (p. 38), respectively. This means the constructed channels are not natural functioning channels that would be allowed to migrate across the floodplain. The Performance Standard is met if the channel remains a controlled channel contained within the constructed graded boundaries. Through Adaptive Management, RM would conduct modification or repair. RM provides no specific recommendations to repair constructed channels.

Comment 25

Corps Comment 7.1.2 (p. 25): *Natural Gas Pipeline - the pipeline that traverses the Sonoita Creek mitigation area represents a major design constraint for the proposed constructed channels. The depth of the pipeline in various sections of the compensatory mitigation area must be identified and the information on the depth of the pipeline should be incorporated into the channel design to minimize the use of bank protection and maximize the ability of the constructed channels to migrate within the adjacent historic floodplain.*

RM Response (p. 25): *The depth of the natural gas pipeline has been evaluated by a professional utility locater service. The resulting map is provided as **Attachment D**. With the redesign of the constructed channels (**Attachment B**), the constructed channels are afforded greater ability to migrate within the floodplain thus reducing the need for bank protection for the gas pipeline and the ponds.*

EPA Comment: The larger constructed channels will not be allowed to migrate freely across the floodplain as depicted by RM (see comments above).

Comment 26

Corps Comment 7.1.3 (p. 25): *Detailed plans for the pond modification from two ponds to a "conglomeration of smaller waterbodies" must be provided within the HMMP. This should include but is not limited to specifics such as grading plans as well as amount of material excavated and the amount and type (soil) of fill. Please be more specific as to the type of "chemical sealant" and provide documentation of the efficacy of such sealants compared to a natural material such as clay.*

RM Response (p. 25): *The pond design has been changed to include six smaller ponds: three in the north pond and three in the south pond.* ***Figures RC-3*** *show plan views of the north pond, and* ***Figures RC-4*** *shows sample cross-sections of the north pond.* ***Figure RC-5*** *shows a plan view of the south pond; the cross-sections are similar to the cross-sections for the north pond shown in* ***Figure RC-4****. The ponds will be drained and dried, and then fill from the adjacent farm fields will be added so that the final depth of water in each pond is approximately three feet. The soil sealant ESS-13 will be incorporated into the bottom of each pond per the manufacturer's recommendation based on samples of the fill material and a target hydraulic conductivity. The sides of the ponds will not be sealed to allow for some seepage to support the existing vegetation surrounding the ponds. Following construction, ponds will be observed to ensure that they are functioning to support the adjacent riparian vegetation and discharging overflows as intended.*

ESS-13 is manufactured by Seepage Control, Inc. and has been used in lakes, ponds, and wetlands, including the Rio Salado Environmental Restoration project overseen by the U.S. Army Corps of Engineers. Case studies can be found on Seepage Control's website at www.seepagecontrol.com. The product reduces the hydraulic conductivity of soils by filling voids in the soil and by chemically and electrically modifying the alignment of the clay platelets in the soil. ESS-13 will not work with sand but will work with most soil textures that include some clay. The farm field that will be the source of the fill material has adequate soil comprised of clays and loams to function effectively with ESS-13.

EPA Comments: Please see EPA's comments to the Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see pp. 9-10 of attachment). We have concerns that the proposed sealant will not work over the long-term in the sandy, alluvial soils which characterize much of SCR.

Comment 27

Corps Comment 7.1.4 (p. 26): *In a later section of the document (9.1.3), RM suggests that the performance criteria for the overflow channel will be met if the length of the surface flow is at least 75% of that identified in the wetted perimeter test. If that is the extent that RM believes this channel will perform, it should be clarified in the current section that construction of the overflow*

channel will provide a link in the physical connectivity of Monkey Spring to Sonoita Creek, but flows at normal events will not extend from Monkey Spring to Sonoita Creek and it is unknown if flows will reach Sonoita Creek in any event. If RM believes that Monkey Spring water will actually flow all the way through to Sonoita Creek, please provide supporting documentation and revise the performance standard. Where will water from Monkey Spring be diverted to during construction? How will this occur?

RM Response (p. 26): *The intended purpose of the overflow channel is to support vegetation along its banks, with the final planting plan based on the wetted perimeter evaluation described in the HMMP. Any water that is not used by plants or does not evaporate from the channel will be recharged. It is possible that, during some periods, overflow water might make it to the reestablished Sonoita Creek channel, but because of uncertainty this is not included as a goal of the overflow channel.*

During construction activities for the ponds, Monkey Spring water will be diverted to the main channel of Sonoita Creek, at the north end of the property. A temporary trench will be dug from the irrigation channel immediately south of the property line, west-southwest to Sonoita Creek. The irrigation channel will be dammed immediately downstream of the temporary trench to divert water through the temporary trench into Sonoita Creek. The ponds will then be allowed to drain, or be pumped, until they are dry.

EPA Comment: There is no information on the amount of water flowing from Monkey Spring. Therefore, it is highly questionable whether there is sufficient water to maintain the ponds or the overflow channel and associated hydro/meso riparian habitat downstream of the ponds.

RM states the purpose of the overflow channel is to support vegetation along its banks and acknowledges the uncertainty of the channel ever carrying flow to the constructed Sonoita Creek channel.

Therefore, mitigation credit should not be provided for the vegetated banks and the overflow channel, since there is no certainty there is sufficient water to support hydro/meso riparian, and the overflow channel may never convey surface flow downstream.

Comment 28

Corps Comment 7.1.5 (p. 26): *According to the HMMP, SCR has been subject to agriculture since the 1940s. At least 115 acres of farmed crops have been supported by flows entering the SCR property. The planting plan identifies DriWater gel packs as the method of delivering water to the planted trees. While such gel packs can provide water to plants, the HMMP does not provide any basis for not irrigating the planted trees (estimated at 900 along the constructed overflow channel and 7,000 at/near the top of the other constructed channels) using the water entering the Sonoita Creek Ranch property. In fact, our discussions with the University of Arizona Agricultural Extension Service (personal communication, April 11, 2014) indicate that native trees must be irrigated daily to afford them the best chance of survival and DriWater gel packs do not provide enough water in establishing newly planted native trees in our arid environment. Native trees do*

not require any soil amendments or fertilizers. We request the technical basis for not irrigating the trees/shrubs at SCR be provided.

RM Response (p. 26-27): *The Sonoita Creek floodplain has the potential to be a grassy savanna, dominated by Sacaton and other perennial grasses, with a varying overstory of mesquite and other woody species, and with a meandering stream channel lined with xeroriparian trees. This potential is partly realized on the uncultivated floodplain at the south end of the SCR property, and is described as the Mesquite, Sacaton alternate state in the Natural Resources Conservation Service (NRCS) Loamy Bottom ecological site guide. We believe that the restoration actions we are proposing will facilitate the evolution of the formerly-cultivated fields towards this grassy savanna. However, we recognize that the evolution will require time and favorable weather, and the full potential will probably not be realized within the 10-year monitoring period. Sacaton will be included in the seed mix for the restored floodplain but is known to be difficult to establish from seed without irrigation. We expect sacaton to colonize the site gradually, but other perennial grasses in the seed mix will prevail during the monitoring period. The relative covers of mesquite, other woody plants, and perennial grasses at various places in the floodplain will depend on the vagaries of the weather; competition among seeded and planted species; depth to groundwater (known to vary along Sonoita Creek from north to south); and unpredictable events like fires, large floods, and insect outbreaks. We therefore expect to see the development of a diverse mosaic of grasses and woody plants throughout the restoration area.*

Outside the overflow channel, plantings of the 7,000 nursery-grown mesquites will be concentrated within and near the graded slopes of the constructed channel. The remainder of the riparian floodplain buffer will be seeded. The goal of this redesign is to improve the likelihood that the riparian floodplain will achieve a natural Mesquite, Sacaton state, with an emphasis on sacaton and other perennial grasses, with high woody vegetation cover near the ephemeral washes.

*A revised conceptual planting plan for Sonoita Creek Ranch has been prepared (**Figure RC-6**); a detailed planting plan will be completed prior to construction of the mitigation project. A sample planting plan (**Figure RC-7**) has been developed which provides an idea of proposed planting near the constructed channel and the overflow channel.*

With regard to irrigation of planted trees, when installed as nursery-grown container stock, most plant species in most locations in southern Arizona require irrigation until established. While some of the nursery-grown species listed in the HMMP (specifically some of those associated with the overflow channel, such as Fremont cottonwood) require frequent irrigation to become established, it is not correct that all native trees must be irrigated daily to become established. In fact, such an irrigation regime contradicts accepted professional practice standards for landscape architecture in southern Arizona. While DriWater containers cannot meet the water demand for all species of newly established native trees during the warmest times of year, the focus on tree planting outside the overflow channel is on native mesquites which are far more drought tolerant than many native tree species. The final HMMP will be revised to require that the nursery-grown trees that will rely on DriWater gels will be installed between October 15 and March 15, in order to allow these trees to become better established before the onset of summer heat. The DriWaters will be installed at the time of planting and maintained for a period of three years.

With the use of DriWater gels during the first three years, use of Monkey Spring water for irrigation is not warranted. It should be noted that these flows will be utilized to maintain water levels in the ponds, with overflow being used to irrigate planted trees associated with the overflow channel. The system is designed to operate as passively practicable, with minimal maintenance. Attempting to utilize flows from Monkey Spring for irrigation of a larger area, after the removal of the current irrigation system and development of the constructed channels, would require a significant investment of time and effort to ensure proper functioning of the irrigation system, thereby increasing the level of uncertainty associated with the mitigation effort.

In addition, the existing ponds currently act as reservoirs for flood irrigation. As discussed in the HMMP, these ponds will be reconstructed to make them shallower and reduce their storage capacity, thereby diminishing their ability to function as reservoirs. Under current operations with flood irrigation, the water levels in the ponds fluctuate with irrigation demand, which would have the potential to expose treated pond soils and put managed sensitive species at risk.

Given the above, it is not practicable to use Monkey Spring water to irrigate vegetation beyond the overflow channel. Also as noted above, if care is given to the timing of tree planting, and supplemental DriWater is provided as needed, additional irrigation is not warranted.

*To better reflect our expectation of a Loamy Bottom ecological site plant community, four wing saltbush will be removed from the native seed mix and the two species of oaks will be removed from the proposed woody species to be planted adjacent to the overflow channel. Table 6 of the HMMP will be revised as shown in (**Table 4**).*

EPA Comment: We concur with the Corps statement that the use of DriWater gel packs will likely not provide sufficient water for the survival of plantings without supplemental irrigation. In addition, monitoring of trees once annually will not be of sufficient frequency to detect tree stress in sufficient time to provide supplemental watering.

Comment 31

Corps Comment 7.2.2 (p. 31): *Please provide detailed engineering design, including grading plans, for the removal of the earthen dams and restoration of the wash channels as well as the timeframe for germination of seeds in all areas to be reseeded with native seed mixes. What will be done with excess fill not used in channel restoration? We request native reseeding occur of the areas along the banks and adjacent uplands affected to restore the stream channels. While in-stream areas would be subject to flow and scour and might not make sense to reseed, soils along the edges of the channel would be disturbed and should be reseeded with a native seedmix to promote recovery of the affected areas. In addition, we request RM include the anticipated native seedmix that would be applied.*

RM Response (pp. 31-33): *Rosemont will remove five earthen dams at Sites 1 through 4 as shown in **Figure RC-8** (Site 3 has two earthen dams). All five of the earthen dams will be removed by grading a smoothly sloping channel from upstream of the earthen dams, through the earthen dams, and connecting finally with the channel downstream of the earthen channel. With the exception of*

the bottoms of the new channels, all of the disturbed areas will be planted with the seed mix described in ***Table 6****.*

The proposed grading for Site 1 is shown in ***Figure RC-9****. Modifications to Site 1 will include a new 225-foot long, 10-feet wide channel bottom, with 4:1 side slopes. The slope of the proposed channel profile will be approximately 4 percent. Construction of the channel will require approximately 700 cubic yards of cut and approximately 130 cubic yards of fill. The remaining material will be placed in the existing cattle pond northwest of the proposed channel or used during repair of the gullies and removal of the roadbeds. An existing 21-inch culvert will be removed. Approximately 6,700 square-feet of the site will be revegetated including the channel side slopes, the existing basins, and any areas disturbed during construction.*

Figure RC-10 *shows the proposed grading for Site 2. Modifications to Site 2 include 106 feet of 12-foot wide channel and 281 feet of 8-foot wide channel. Currently, the upstream channel splits to go around a raised area in the middle of the existing channel. This split will be maintained with the proposed channel, and each side channel bottom will be 8-feet wide. The two channels will tie into a 12-foot wide channel that continues through the existing earthen dam to the downstream end of the proposed modifications. Channel slopes will vary from 3.8 percent to 4.3 percent. Rock rip-rap will be placed on the outside of the western channel where it curves into the main channel to protect the channel cross-section and to inhibit migration of the channel. Construction of the channel will require approximately 465 cubic yards of cut and 80 cubic yards of fill. The remaining material will be used in the center island, to fill the existing basin, or will be removed from the site. Two existing 24-inch diameter culverts will be removed, and the small drainage downstream of the pipes will be filled. Approximately 10,200 square-feet of the site will be revegetated including the channel side slopes, the existing basins, and any areas disturbed during construction.*

*Site 3 includes two earthen basins (****Figure RC-11****). The proposed channel includes approximately 238 feet of new channel from the upper basin to the lower basin with an approximately 5.5 percent slope, and approximately 307 feet of 12-foot wide channel at a slope of approximately 1.3 percent. The upper channel follows the path of the existing overflow from the upper basin to the lower basin, but with a wider channel bottom and a shallower slope. The bottom width of the upstream channel varies from 12 feet at the bottom end to approximately 60 feet at the extreme upstream end to capture the full channel width. Rock rip-rap will be place on the outside of two curves in the channel to inhibit migration of the channel, and at the slope transition to reduce energy in the flow from the steeper channel profile. Construction will require approximately 12,200 cubic yards of cut and 1,550 cubic yards of fill. The remaining material will be used to fill in the remaining basins or will be removed from the site. Approximately 17,400 square-feet of the site will be revegetated including channel side slopes, the existing basins, and any areas disturbed during construction.*

The proposed grading for Site 4 is shown in ***Figure RC-12****. Modifications to Site 4 will include a new 365-foot long, 12-feet wide channel bottom, with 4:1 side slopes. The slope of the proposed channel will be approximately 3.8 percent. Rock rip-rap will be placed at the curve in the downstream end of the channel to protect the channel cross-section and to inhibit migration of the channel. Construction of the channel will require approximately 1,275 cubic yards of cut and 145*

cubic yards of fill. The remaining material will be placed in the existing cattle pond on either side of the proposed channel or will be removed from the site. Approximately 17,400 square-feet of the site will be revegetated including channel side slopes, the existing basins, and any areas disturbed during construction.

EPA Comment: We have several concerns with the proposals to remove five earthen dams at Sites 1-4. First, RM has not yet provided a compelling justification that removal of the dams/ponds will actually result in measurable benefits to waters. RM has provided no pre- or post-project functional assessment to quantify the alleged ecological benefits to waters of dam/pond removal. As we have discussed elsewhere in our comments, the ponds that form behind the existing dams provide potentially important functions that will be impacted by dam removal. Presumably, these dams were constructed to capture and store surface runoff for use by livestock for some period of time after their tributary drainages have ceased flowing. This function (*i.e.*, short-term surface and subsurface water storage) would also be important for wildlife as a seasonal water source. Seasonal pond habitats in arid environments are known to function as important sources of water, and resting and feeding areas for birds and other wildlife. RM has not quantified the loss of this and other important aquatic functions such as sediment storage, retention and transformation of particulates and other compounds, or the storage of organic carbon. In fact, RM has proposed as mitigation at other locations the construction of ponds/tanks to store water for wildlife.

In addition, the grading/recontouring of sediments in the existing waters within the ponds are themselves impacts that have not been quantified; it is quite possible that the area of waters lost from removing the ponds will be greater than the area gained by reestablishing the stream channels. RM should first be required to offset any impacts to the area of waters and the functions associated with the dams/ponds prior to consideration of whether they should receive additional mitigation credit. Finally, for several of the ponds RM is proposing the use of rock rip-rap to armor banks to prevent channel migration. The use of rip-rap not appropriate as it is well known that armoring can result in additional unforeseen downstream impacts as the restored channel flows adjust to the artificially hardened banks. In addition, banks with rip-rap often require regular monitoring, maintenance and repair. The proposed use of rip-rap in the channel design calls into question whether the removal of the dams/pond sites is suitable mitigation.

Comment 33

Corps Comment 7.2.4 (p. 34): *While the text is clear 3.5 miles of existing roads would be removed and their roadbeds revegetated, there is no specification of a native seedmix. We request this be included in the HMMP. How was the total affected area of 4.5 acres calculated? Please indicate how much of this is WUS and how this work plan benefits WUS.*

RM Response (p. 34): *The abandonment and reclamation of the 3.5 miles of roadway will reduce concentrated, high velocity storm flows that currently discharge from the roadways into the onsite receiving Waters, with the attendant high sediment loads and scour effects. The 4.5 acres of reclaimed roadway is based on an average road width of 10 ft.*

The abandonment of the roadways will include removal of any excess sediment and scarifying of the substrate within Waters, as appropriate. This includes both perpendicular crossings

(approximately 0.02 acres of Waters) and areas where roadways occur within washes (approximately 370 linear feet and 0.2 acres of Waters). Improvements to Waters resulting from earthen dam removal are not included in this estimate.

The native seed mix recommended for the revegetation of the reclaimed roadbeds is the same as that identified in the response to ***Comment 31****.*

EPA Comment: RM has provided no pre- or proposed post-project functional assessment to quantify the area of waters that may benefit from road reclamation. We are curious *how* it was determined/quantified that 4.5 acres of currently contribute high velocity storm flows and sediment to waters? How was sediment measured? What constitutes excess sediment to be removed? What is the measurable effect on existing waters? How many acres/linear feet of waters are affected?

RM is already seeking mitigation credit for buffers adjacent to existing waters. Presumably, these buffers will function to protect the existing waters from many of the impacts associate with roadways. It is not appropriate to receive additional credit for abandonment and reclamation of roadways that will be protected by the improved buffers from the cessation of grazing.

Comment 34

Corps Comment 7.2.5 (p. 34): *There is not enough information in this section regarding impacts to WUS and where each methodology will be applied along the two miles of road to be maintained.*

RM Response (pp. 34-35)*: As with the abandonment and reclamation of unnecessary roads, the mitigation practices proposed for the remaining roads (****Figure RC-13****) are designed to reduce concentrated, high velocity storm flows that currently discharge from the roadways into the onsite receiving Waters, thereby reducing sediment loads and scour effects. The techniques described in this section of the HMMP are designed primarily to occur in steep upland areas and will be located in the field. The crossings of Waters for the remaining road are at grade and additional treatments are not recommended in these areas.*

EPA Comment: It appears RM is proposing mitigation credit to maintain their roads at FR? This proposal is unacceptable as mitigation to offset loss of acreage and function to aquatic resources. Similar to our comment above (Corps Comment 7.2.4), RM has provided no pre- or proposed post-project functional assessment to quantify the area of waters that may benefit from road maintenance.

RM is already seeking mitigation credit for buffers adjacent to existing waters. Presumably, these buffers will function to protect the existing waters from many of the impacts associate with roadways.

Comment 35

Corps Comment 7.2.6 (p. 35): *Zeedyk and Clothier (2009), as referenced in the HMMP, state that Induced meandering can only be done on incised stream channels, that not all incised stream channels are candidates for this methodology, and use of this methodology requires a reference site. While a few of the gullies identified on Figure 17 are actually within the wash channels, most are not and appear to be from erosion within the uplands. We do not believe that the current*

documentation in the HMMP supports use of induced meandering for rehabilitation of gullies at FR. However, we are open to reconsideration if RM wishes to provide a detailed plan in the HMMP which uses this methodology and identifies which are documented candidate gullies, which are not, and the specific treatments for those gullies which are candidates for successful implementation of the methodology. In addition, we request RM provide information on the credentials of the biologists/hydrologists who make the above determination and who would construct these features? We request native reseeding be included in the gully repair protocol as well, including specification of the anticipated native seed mix.

RM Response (p. 35): *The gullies identified at Fullerton Ranch fall broadly into two categories: 1) those located within identified Waters that exhibit an observable ordinary high water mark (OHWM), and 2) those that have formed in uplands (**Figure RC-14**). While the HMMP recommends an induced meandering evaluation for all identified gullies, it is more reasonable to address those gullies that developed in uplands differently.*

*The final HMMP will be revised to indicate that gullies that formed in uplands will be graded out, either with machinery or with hand tools, so that they no longer concentrate surface water flows. Storm water flows through these areas will instead spread out as sheetflow, inhibiting erosion. The graded areas will be reseeded with the same seed mix described in the response to **Comment 31**.*

*Gullies that have developed into Waters (**Figure RC-14**) total approximately 1.2 acres. These features will be evaluated by a credentialed professional to determine whether induced meandering is warranted to address the erosion and prevent further degradation. Both Zeedyk and Clothier, as well as others, offer these services, and one of these professionals will be consulted to determine whether induced meandering, or another technique, is warranted or appropriate.*

EPA Comment: Again, RM is seeking mitigation credit for proposed activities for which we have no pre- or post-project functional assessment. RM has provided no measurable data on the linear extent or severity of erosion or channel degradation in existing waters, nor have they clearly identified the cause of any such degradation. Without an assessment of existing functions there is no way to determine what amount of credit, if any, RM should receive for their proposed mitigation. For the alleged 1.2 acres of gullies that have developed in waters, RM states that it will consult with professionals on design elements at some *future* date. As such, RM is asking that we accept *on faith* their proposal to prevent erosion and degradation in the absence of supporting data or analysis by qualified professionals. RM presents no supporting justification for how it was determined that 1.2 acres of gullies have developed in waters. How is a *gully* within waters differentiated from a naturally incised drainage channel and how would the proposed mitigation result functional gains to the channels? What is to prevent the gullies from reestablishing with the waters?

We are also concerned that RM is seeking mitigation credit for the remediation of upland gullies without any functional assessment. Many upland gullies in the arid Southwest are natural features In addition, grading, filling and reseeding upland gullies does not guarantee that the gullies will

not reform in the same location, especially if the causes leading to gully formation are not fully understood.

Comment 37

Corps Comment 7.3 (p. 36): *Any Davidson Canyon Parcels which the Corps approves for preservation will need to be fenced to prevent grazing. Belsky et al. (1999) found that "no positive environmental impacts" result from livestock grazing. 33 CFR § 332.3(h) enumerates the criteria for a parcel to be used for preservation. We believe grazing, even if "managed", is counter to the criteria for preservation.*

RM Response (p. 36): *It is unclear what part of the language at 33 CFR § 332.3(h) would preclude grazing from a preservation parcel, and in fact the language at 33 CFR § 332.7(a)(2) regarding site protection provides that "multiple instruments recognizing compatible uses (e.g., fishing or grazing rights) may be used."*

*However, the final HMMP will be modified to exclude grazing for the Davidson Canyon Parcels (**Figure RC-15**). The additional cost associated with fencing has been calculated and incorporated into the long-term funding estimates. The long-term management and maintenance associated with fencing (i.e. inspection, repairs, and replacement) will be similar to that for Sonoita Creek and Fullerton ranches.*

EPA Comment: Please refer to previous EPA comments to the Corps of Engineers contained in *Comments on Rosemont Copper Project Habitat Mitigation and Monitoring Plan Permit No. SPL-2008-00816-MB*, dated April 9, 2014 (see attachment, p. 14-15). We believe the Davidson Canyon Parcels are not acceptable mitigation under §404 CWA and fail to meet the criteria for preservation in the 2008 Mitigation Rule (33 CFR 320.3(h)(1)).

In addition, the ecological functions associated with streams and associated xeroriparian habitat in Davidson Canyon parcels will be degraded from the proposed mine due to the magnitude of the impacts (e.g., reductions in stormwater flows and groundwater drawdown).

Section 8 Maintenance Plan

Comment 38

Corps Comment *8 (p. 36):* *Overall, we believe the maintenance plan is vague and does not provide adequate detail. Maintenance should occur on all parcels regardless of whether they include restoration, enhancement, or preservation. All fencing repairs, whether minor or major, should be made in less than two weeks. The Corps should be notified within 24 hours of detection of a MAMA. Report forms, similar to that for MAMAs, should be provided for MIMAs as well.*

RM Response (pp. 36-37): *The final HMMP will be revised to include additional details related to maintenance, as described here. In addition, the final HMMP will be modified to reflect that all fence repairs will be completed within two weeks of identification, and that the Corps will be notified within 24 hours of a MAMA. The HMMP notes that both MIMAs and MAMAs will be reported on standard forms.*

Sonoita Creek Ranch – As described in the HMMP, the restoration and enhancement designs at Sonoita Creek Ranch are designed to function as passively and be as maintenance free as possible. Maintenance considerations for individual mitigation components at Sonoita Creek Ranch are as follows:

*• Constructed channels and riparian buffer – as noted in the design prepared by WET (**Attachment B**), the constructed channels are designed to require no maintenance. Because the planted trees associated with the constructed channels will be watered with DriWater gels, maintenance of an irrigation system will not be required. Areas of minor erosion will be dealt with as a MIMA, while evidence of more significant erosion will be addressed as a MAMA, or possibly through adaptive management.*

• Ponds – the pond enhancements are designed to be as passive and self-sustaining as practicable, with no pumps or complex controls. Flows between ponds and from the southern pond to the overflow channel will be via gravity. Minor maintenance may be required in association with the constructed berms and weirs within the ponds, or with the chemical sealant.

• Overflow channel and riparian habitat – as described above, flows into the overflow channel will occur via gravity, requiring no complex controls. Areas of minor erosion will be dealt with as a MIMA, while evidence of more significant erosion will be addressed as a MAMA, or possibly through adaptive management.

Fullerton Ranch – Following implementation of the construction activities at Fullerton Ranch, the primary maintenance requirements will be for the fencing and unpaved roadway. Significant erosion or other maintenance problems are not anticipated once the earthen dams have been removed, the unnecessary roadways have been abandoned and reclaimed, the remaining roadway has been improved with stormwater controls, and the gullies have been addressed. Any requirements to address unanticipated maintenance issues (e.g. excessive erosion resulting from an extreme storm event) may be paid for out of the contingency considered in the long-term funding.

Fencing maintenance will be as described in the HMMP. Maintenance for roadways is anticipated to be required following significant rainfall events, though the proposed controls will reduce the maintenance requirements from the current condition. Areas of minor erosion will be dealt with as a MIMA, while evidence of more significant erosion will be addressed as a MAMA.

Pantano Dam – Maintenance required for the Pantano Dam is expressly discussed in Section 8.5 of the HMMP. Additional discussion is not warranted.

Davidson Canyon Parcels – Maintenance requirements at the Davidson Canyon Parcels relate primarily to fencing, as described in Section 8.2 of the HMMP.

EPA Comment: RM does not provide an adequate maintenance plan as required in the 2008 Mitigation Rule. Identifying the elements of an extremely high risk mitigation plan as "passive

and maintenance free as possible" and "passive and self-sustaining as practicable," only serves to emphasize the need for a comprehensive maintenance plan.

Section 9 Performance Standards

Comment 39

Corps Comment 9 (p. 37): *The performance standards within the mitigation plan are severely lacking and are not in compliance with the requirements of 33 CFR § 332.5(a) and (b), which include that standards be quantifiable to determine if the compensatory mitigation is developing into the target resource type, providing the expected functions, and attaining other prescribed metrics. We request the HMMP be revised to be more specific with respect to the percent vegetation/canopy targets and to consistently specify whether each number or range identified is absolute or relative cover. Performance standards need to be as specific and clear as possible. The detailed performance standards should extend to the constructed channels,overflow channel, ponds, and enhanced riparian/WUS areas.*

RM Response (pp. 37-38): *Performance standards for all mitigation types have been revised or clarified to ensure that they are measurable and achievable, per this comment. The performance standards proposed for the Rosemont mitigation sites are guided by the recognition that functional plant communities are indicative of functional hydrologic parameters, promote diverse biogeochemical processes in the soil, and are necessary to support native wildlife communities. With this perspective, measuring success of the plant community, including structure, diversity, and cover, can be a proxy measure of success for other criteria in terms of function and value.*

Detailed performance standards and associated rationale are provided in responses to ***Comments 40 through 45.***

EPA Comments: The mitigation plan does not provide adequate information regarding the performance standards as required in the 2008 mitigation rule. Despite clear instruction from the Corps, performance standards are missing or inadequate for several components of the plan. The rule requires that every mitigation plan include objective and verifiable ecological performance standards to assess whether the compensatory mitigation project is achieving its objectives (Preamble 19597, 33 CFR 332.4(c)(9)).

Having reviewed RM's responses below on Corps Comment 9.0 – 9.2.2.2, it is apparent that RM's failure to provide Performance Standards for mitigation is because: 1) RM cannot achieve their mitigation objectives; and 2) there is little to no ecological benefit for the mitigation they are proposing.

EPA is providing specific comments in response to RM's performance standards below:

Comment 40

Corps Comment 9.1.1 (p. 38): *We believe the constructed channels and overflow channel will have achieved their designed performance criteria when they have received significant enough flows to determine they are functioning properly and meet established performance criteria.*

Please revise the HMMP accordingly or provide further documentation to support that their designed performance criteria are met when construction is complete.

RM Response (p. 39): *The challenge with tying performance criteria to flow events in ephemeral systems, particularly under the extended drought conditions that southern Arizona is currently experiencing, is that a flow event of a magnitude to extend through the constructed channels may take several years to occur, and may not even occur within the 10-year monitoring period. However, Rosemont agrees that monitoring of the channels following such a flow event is the most effective way to confirm that the performance criteria have been met. The final HMMP will be modified to reflect that the performance standards for the constructed channel and the overflow channel will be as follows (**Attachment B**):*

- *As-built drawings and photographs will be completed and submitted to the Corps following completion of construction to document the baseline geometry of the channel system.*

- *Observation or demonstration of flow occurrence through all restored and constructed channel segments following a significant runoff event.*

- *Lateral migration of the channel is contained within the constructed graded boundaries.*

- *The longitudinal channel profile keeps its concave shape with no headcuts.*

*Performance standards for the vegetation associated with these channels and the riparian floodplain bufferare provided in the response to **Comment 41**.*

EPA Comment: In response to Corps Comment 9.1.1, RM admits that, *a flow event of a magnitude to extend through the constructed channels may take several years to occur, and may not even occur within the 10-year monitoring period.* This statement comports with EPA's previous comments in response to Corps Comment 7.1.2 (pp. 17-19) regarding the ability of SCR constructed channels to function as designed and provide ecological benefit to the aquatic ecosystem.

RM proposes performance standards that are not in fact standards, but only as-built drawings and observations.

RM's performance standard of ensuring, "Lateral migration of the channel is contained within the constructed graded boundaries," demonstrates the need to confine the channel, which is contrary to natural functioning floodplain channels and is not a performance standard but a maintenance action (RM, p. 38).

Comment 41

Corps Comment 9.1.2 (pp. 38-39): *Please revise the performance standard to also include a percent cover target for shrubs. We recognize the target might need to be low through the 10-year monitoring period, but shrub cover is identified as a component of the Mesquite, Sacaton state and shrub species are included in the proposed native seed mix; therefore, a specific and clear target should be included. In addition, performance standards for trees should include % canopy cover*

and diameter at breast height ("dbh") in addition to survivorship to indicate the trees are in a living and growing condition.

RM Response (p. 39): *Rosemont agrees that a performance standard for shrub cover is appropriate, though given the nature of the seeding and planting design at Sonoita Creek Ranch, a combined woody species performance standard for shrubs and trees has been developed. It is anticipated that the containerized trees along with the trees and shrubs that sprout from seeds will grow as a cohort during the 10-year monitoring period; because of this, segregation of trees from shrubs does not appear to be warranted.*
The final HMMP will be revised to reflect the following performance standards for the vegetation at Sonoita Creek Ranch:
1. Constructed channel (mesquite plantings and seeding)
a. Absolute canopy cover of native perennial grasses ≥15 percent (per NRCS Ecological Guide)
b. Relative cover of native species ≥75 percent (SPD Unified Performance Standards)
c. Absolute cover of exotic species ≤10 percent (SPD Unified Performance Standards)
d. For woody species (trees and shrubs): ≥80 percent survivorship of planted individuals (wildling substitutes allowed)
e. The average height and diameter of root collar (DRC) of marked woody species will not decrease following 2 years without irrigation.
2. Overflow channel
a. For woody species (trees and shrubs): ≥80 percent survivorship of planted individuals (wildling substitutes allowed)
b. The average height and diameter of root collar (DRC) of marked trees will not decrease following 2 years without irrigation.
3. Riparian floodplain buffer (seeding only)
a. Absolute canopy cover of native perennial grasses ≥15 percent (per NRCS Ecological Guide)
b. Relative cover of native species ≥75 percent (SPD Unified Performance Standards)
c. Absolute cover of exotic species ≤10 percent (SPD Unified Performance Standards)
d. Absolute canopy cover of mesquite and other woody species: ≥5 percent.

The minimum absolute cover values of woody species in the floodplain and constructed channel represent lower limits for the woody cover expected at the appropriate NRCS ecological sites: Loamy Bottom, 12 to 16 inch precipitation zone, Mesquite, Sacaton state; and Sandy Wash, 12 to16 inch precipitation zone, respectively.

EPA Comment: RM cites an NRCS Ecological Guide, but there is no citation available. What is lacking is a demonstration of how these vegetative performance standards apply to this particular ecological setting. RM has provided no data upon which to measure the proposed performance standard. Based on our field observations at undisturbed sites, these standards are far too low.

Comment 42

Corps Comment 9.1.3 (p. 40): *The performance standard for the length of surface flow is neither clear, nor does it appear to have a scientific or technical rationale. It appears to us the intent of*

the constructed overflow channel is to support vegetation growing along the lateral edge of the channel as well as to convey surface flow to the constructed/re-established channel downstream. We request the HMMP be modified to clarify the intent fully and to support this or whatever performance standard(s) is/are proposed.

RM Response (p. 40): *As described previously, the intended purpose of the overflow channel is to support vegetation along its banks, with the final planting plan based on the wetted perimeter evaluation described in the HMMP. Any water that is not used by plants or does not evaporate from the channel will be recharged. It is possible that, during some periods, overflow water might make it to the reestablished Sonoita Creek channel, but because of uncertainty, this is not included as a goal of the overflow channel. The performance standard for vegetation in the overflow channel is provided in the response to* ***Comment 41****.*

*The PVC liner has been removed from the conceptual design and replaced with a compacted soil liner (****Figure RC-16****). If a source of soil with adequate clay is not available on the site, the PVC liner might be used in place of the compacted soil liner. Again, the purpose of the liner is to move infiltrating water laterally to the site of the proposed vegetation.*

EPA Comment: First and foremost, there is no information on the amount of water flowing from Monkey Spring. Therefore, it is highly questionable whether there is sufficient water to maintain the ponds or the overflow channel and hydro/meso riparian habitat downstream of the ponds.

Secondly, RM states the purpose of the overflow channel is to support vegetation along its banks and acknowledge the uncertainty in the channel ever carrying flow to the constructed Sonoita Creek channel. Recognizing the unlikelihood of the channel providing any measurable functional gain or acreage (as a water of the U.S.), RM has proposed no performance standards for this mitigation.

RM's proposal to keep water moving laterally in the overflow channel using compacted soil liners or PVC liner would require high maintenance and monitoring and is subject to high risk and failure.

Therefore, mitigation credit should not be provided for the vegetated banks and the overflow channel, since there is no certainty there is sufficient water to support hydro/meso riparian, and the overflow channel may never convey surface flow downstream.

Comment 43

Corps Comment 9.1.5 (p. 40): *Performance standards should be established for enhanced areas. We suggest sample plots be established with baseline data; the performance standards should be similar to those described at 9.2.2.2 below.*

RM Response (pp. 40-41): *As noted in the HMMP, Sonoita Creek Ranch has not been as intensively grazed as Fullerton Ranch, so a substantial response in vegetation resulting from the exclusion of grazing is not anticipated. However, it is anticipated that the buffer area adjacent to the ephemeral washes at the site will experience some recovery following livestock grazing exclusion, and these areas would be expected to achieve performance criteria comparable to the*

Sonoita Creek floodplain as these areas are both classified as Loamy Bottom or Loamy Swale ecological sites by NRCS. As in the floodplain of Sonoita Creek, historical grazing has reduced the cover of sacaton grass in the tributary floodplains; because of the slow-growing nature of sacaton, it is unrealistic to expect a rapid recovery of sacaton cover. Other perennial grasses, however, should increase to 25 percent canopy cover or more within 10 years in the absence of grazing, assuming favorable precipitation.

The performance standards for enhanced buffer areas at SCR, therefore, are established as follows:
- *Canopy cover of native perennial grasses: ≥ 25 percent;*
- *Relative cover of native species: ≥ 75 percent;*
- *Absolute cover of exotic species: ≤ 10 percent.*

A performance standard for woody plant cover in the enhanced areas is not warranted because changes in this cover type are not anticipated from exclusion of livestock grazing.

Cover transects will be established in the tributary floodplains to monitor the canopy covers of perennial grasses, native species, and exotic species, and these transects will be monitored annually.

EPA Comment: RM notes in their response that SCR has not been intensively grazed compared to FR. While RM anticipates some recovery following livestock exclusion, they propose performance standards for buffer area adjacent to the ephemeral washes. These buffers may currently be meeting RM's proposed performance standard for success. RM has not demonstrated they can provide any measurable improvement in the existing function of the buffer area.

Comment 44

Corps Comment 9.2.2.1 (p. 44): *Please modify the HMMP on page 60, third paragraph, first sentence, to clarify whether field data were collected at a representative site or at multiple representative sites.*

RM Response (p. 44): *The HMMP will be revised per the comment, as follows.*

To explore the potential for reducing sediment yield at Fullerton Ranch, the Rangeland Hydrology and Erosion Model (RHEM) was used with field data collected at one representative site on the ranch to generate a range of outputs under alternate scenarios. RHEM is an online tool, developed by the USDA Agricultural Research Service, to calculate sediment yield from rangeland sites in the southwest (Nearing et al. 2011; Goodrich et al. 2011). The model uses inputs collected in the field, including slope, aspect, soil texture, plant canopy and basal cover, and ground cover of litter, gravel, and rock.

The field data was collected on an alluvial upland site, with 10 percent slope and sandy loam soil. Rock and gravel cover was over 40 percent. The vegetation was dominated by mesquite, ocotillo and fairy duster, with a few heavily-grazed perennial grasses. Total canopy cover of all plants was

26 percent; perennial grass canopy cover was only 5 percent and perennial grass basal cover 1 percent.

EPA Comment: RM sampled only one site on the 1800-acre ranch. This is not representative of the varying conditions of the site and cannot be accepted as a baseline condition. Therefore, there is no information on how RM will demonstrate any functional gain at the site.

Comment 45

Corps Comment 9.2.2.2 (p. 41): *The HMMP states, "Given the heavily impacted nature of the site, a significant vegetative response is reasonable to anticipate"; however, the performance standards are extremely vague and should be modified to include quantification. Please revise this performance standard to be more specific, clear, and verifiable with respect to assessing vegetative response. As written, it appears any increase (or even inconsistent increases) in vegetative cover over multiple years (a trend) could constitute an upward trend and therefore success. We request a more robust performance standard(s) to determine whether exclusion of livestock grazing is having a demonstrable beneficial effect on the ecosystem. The monitoring period at FR should also be ten years, not five years as indicated in the HMMP.*

RM Response (pp. 41-42): *We believe that, given the extreme variability in precipitation in southern Arizona, demonstration of a trend in vegetation growth is more informative than the establishment of a quantitative performance standard. However, the final HMMP will be revised to include a performance standard for the vegetative response to exclusion of livestock grazing as follows:*

- *The total percent canopy cover of perennial grasses will double (e.g. from 5 percent to 10 percent) at 75 percent or more of the monitoring plots within 10 years.*

Given the condition of the site and high degree of variability of precipitation, a 100 percent increase of the total percent canopy covers of the perennial grasses is a realistic performance standard, though greater increases are likely if precipitation is favorable during the 10 year period. This level of perennial grass canopy cover is reflected in the ungrazed, or lesser grazed, areas outside the mitigation parcel fence.

Based on the literature review and the outcome of the Rangeland Hydrology and Erosion Model simulations reported in the HMMP (section 9.2.2.1), a 100 percent increase in the perennial grass cover will provide substantial improvement to the sediment loading and flow velocities in the onsite ephemeral Waters.

EPA Comment: We are very skeptical that an increase in perennial grasses from 5% to 10% will provide any meaningful functional lift in terms in of sediment loading and flow velocities in the onsite ephemeral waters. RM speculates that an increase of 5-10% will provide substantial improvement without any quantitative analysis to support this conclusion. Where is the data to support this finding?

EPA position remains the same that removal of grazing does not constitute enhancement and should not be considered as mitigation to offset the loss of function and acreage of aquatic resources in the Cienega Creek Watershed.

Section 10 Monitoring

Comment 47

EPA Comment: The Corps provided several comments 10.1.1 – 10.4 regarding monitoring of the mitigation sites. Although there is insufficient time to comment in detail on RM's responses, we have noted the following concerns: 1) The monitoring plan does not provide sufficient detail and in many instances does not provide a way to quantifiably measure mitigation success (*e.g.*, aerial photography of the ponds to evaluate habitat condition, p. 44); 2) The frequency of monitoring is inadequate or not described. Proposed annual monitoring of the mitigation sites would fail to identify site stresses (*e.g.*, inadequate hydrology and plant mortality), resulting in temporal or permanent impacts to functional gain or acreage at the mitigation site; and 3) monitoring periods are too short to measure mitigation success.

Under this section, the Corps questions the performance standards and monitoring at FR for rehabilitated areas such as earthen dams, roads and gullies. RM's proposal fails to provide adequate, measurable performance standards and monitoring at FR (*e.g.*, RM proposes completion of construction as a performance standard (p. 45) and annual monitoring only, pp. 42-45). Contrary to the Corps' request, RM's monitoring and performance standards will not result in any meaningful measure for mitigation success.

Corps Comment 10.1.1 (p. 42): *The text in the first sentence discusses the constructed channel braid, but there would be multiple braids or channels under the proposed design. Please revise for clarity. Specific measures on monitoring the function and condition of the constructed channels, overflow channel, and ponds should be identified. As-builts should be provided. In addition to the data to be collected at each transect, trees should be monitored for an increase in canopy cover and dbh.*

RM Response (pp. 42-44): *This section of the HMMP will be revised to accurately reflect the braiding of the constructed channels, as described in* ***Attachment B****. The HMMP will also be revised to reflect that as-builts will be provided for all constructed features (constructed channels, overflow channel, and ponds) once they have been completed. Specific monitoring approaches for the individual components at Sonoita Creek Ranch are described below.*

*Constructed Channels-Physical Monitoring – Monitoring of the physical components of the constructed channels is described on pages 21 and 22 of the WET design report (****Attachment B****). This monitoring program will be incorporated into the final HMMP.*
Constructed Channels-Vegetation Monitoring – An estimated 7,000 containerized trees (almost all Prosopis velutina) will be planted on and near the graded slopes of the constructed channel. The survival and growth of these trees will be monitored annually, as well as the composition and cover of herbaceous

vegetation. Eighteen belt transects (4 m x 150 m) will be located along the constructed channel, parallel to (but outside of) the channel bottom, and within the approximately 160 foot width of the planting zone. To avoid clustering, the transects will be distributed in 18 reaches of the constructed channel (each reach approximately 1,000 feet long). Transect locations will be chosen randomly within the selected reaches, after grading activities, seeding, and planting have been completed, in order to ensure that they fall within the planted zone.

At each belt transect, the following data will be collected:

- *Density by species (number of individual trees per acre).*
- *Woody plant height and diameter at root collar (DRC). Measurement of diameter at breast height (DBH) of xeroriparian woody species like mesquite is impracticable because the plants tend to be multi-stemmed and may not attain breast height for several years. To capture the living and growing condition of the woody species, height and diameter at root collar are appropriate measures for multi-stemmed woody plants of low stature (Herrick et al. 2005). DRC for a multi-stemmed plant is the square root of the summed diameters of the stems. All woody plants in the belt transects will be marked and their heights and DRC measured, except for volunteer recruits (seedlings) <25 cm tall.*
- *Canopy cover of all species and ground cover.*
- *Photos will be taken of each belt transect.*

*Overflow Channel-Physical Monitoring – Monitoring of the physical components of the overflow channel is described on pages 21 and 22 of the WET design report (**Attachment B**). This monitoring program will be incorporated into the final HMMP.*

Overflow Channel-Vegetation Monitoring – Three pairs of monitoring plots will be established along the 2,360-foot long Overflow Channel following completion of grading activities and the wetted perimeter investigation (see Section 7.1.4 of the HMMP). These plots will be randomly located within the wetted perimeter zone adjacent to the overflow channel and located within three reaches of the channel – each approximately 800-feet long - to avoid clumping of the plots. Two plots will be located directly opposite one another on either side of the channel. The plot width will be adjusted to encompass the full wetted perimeter zone, and to result in a 500 square meter plot. At each plot, the following data will be collected in the same manner as at the constructed channel:

- *Density by species (number of individual trees per acre).*
- *Height and diameter at root collar.*
- *Canopy cover of all species and ground cover.*
- *Photos will be taken of each belt transect.*

Ponds – Annual aerial photography will be used to determine whether the pond-side riparian vegetation is dying back to ensure seepage from the ponds is adequate to maintain the riparian gallery. In addition, the depth of water in the pond will be monitored regularly to ensure that there are sufficient and consistent water levels to support native aquatic vertebrates.

Seeded Floodplain-Vegetation Monitoring – Following the tilling and planting of the former farm fields, ten transects (150 m long) will be established in the restored floodplain to evaluate changes in vegetation. To avoid clustering, the transects will be distributed in five approximately 1,100 foot long sections of the seeded floodplain. Two transect locations will be chosen randomly within each section, one on either side of the constructed channel, but outside of the approximately 160-foot wide zone planted with mesquites. At each transect, canopy cover of all species and ground

cover will be evaluated with the line-point intercept method along the center line of each belt transect (Herrick et al. 2005). In addition, photos will be taken at select locations on each transect. Enhanced Tributary Buffers-Vegetation Monitoring – Eight transects (150 m long) will be randomly located in the buffer zones of enhanced tributary streams of Sonoita Creek (Corral Canyon and four un-named tributaries to the north) to evaluate changes in vegetation. Corral Canyon is much larger than the other tributary streams, and the stream length will be divided into 4 sections, with one transect allocated to each section. At each transect, canopy cover of all species and ground cover will be evaluated with the line-point intercept method along the center line of each belt transect (Herrick et al. 2005). Photos will be taken of each transect.

Comment 48

Corps Comment 10.2 (p. 44): *Monitoring at FR should occur for ten years (same as SCR). Please revise the HMMP from a five-year monitoring period to a ten-year monitoring period.*

RM Response (p. 44): The final HMMP will be revised to reflect a 10-year monitoring period at Fullerton Ranch.

Comment 49

Corps Comment 10.2 (p.44) *We request the HMMP be modified to include specific performance standards to assess the performance and success of the actively re-established stream reaches/adjacent affected areas (which we request be reseeded with a native mix), gully repair locations (which we request be reseeded with a native mix), and road removal and revegetation activities. In areas where earthen dams, roads and gullies are being removed, the rehabilitated areas must be evaluated during the monitoring period using specific performance standards that document that natural channel morphology is not only restored but maintained during the monitoring period. As-builts should be provided for all restoration activities at FR. The HMMP states seven of the twelve monitoring plots have been established. Please provide the locations of the remaining five plots. The data generated for the FR monitoring plots should be evaluated to determine if it meets functional and quantifiable standards and not just trends, as previously discussed.*

RM Response (pp. 44-46): *To date, seven monitoring plots have been established and sampled at Fullerton Ranch. These seven plots are distributed in the northern and central two-thirds of the Ranch area. The remaining 5 plots will be located to represent the Bedrock Hills (1 plot), Alluvial Hills (2 plots), Xeroriparian floodplain (1 plot), and Alluvial upland (1 plot) land types, and will include the southern third of the Ranch. These plots will be sampled according to the protocol described in the HMMP (section 10.2.1), and the revised performance standard will be the same as that of the other plots at Fullerton Ranch:*

- *The summed canopy covers of the perennial grasses will double (e.g. from 5 percent to 10 percent) at 75 percent or more of the monitoring plots within 10 years.*

The rationale for this performance standard is provided in the response to Comment 45. Specific monitoring approaches for the individual components at Fullerton Ranch are described below.

Earthen Dam Removal – the final HMMP will be revised to reflect the following performance standards for the reestablished streams resulting from the earthen dam removal. These features will be monitored annually until the performance criteria are met:

• Successful completion of proposed construction activity and reseeding.

• No development of headcutting following a large storm event (e.g. 3 inches of rain in 24-hours which is roughly equivalent to the 10- year, 24-hour storm event)

• No channel migration outside the constructed channel, top of berm to top of berm

• Vegetative canopy cover at least 70 percent of adjacent habitat.

Photo-documentation and drawings and/or maps depicting the final configuration will be submitted to the Corps up completion of the construction activities.

Abandonment and Reclamation of Unnecessary Roads – the final HMMP will be revised to reflect the following performance standards for the abandoned and reclaimed unnecessary roads. These features will be monitored annually until the performance criteria are met:

• Successful completion of proposed construction activity and reseeding.

• No development of excessive erosion (e.g. gullies) following a large storm event (e.g. 3 inches of rain in 24-hours which is roughly equivalent to the 10-year, 24-hour storm event)

• Vegetative canopy cover at least 70 percent of adjacent habitat.

Photo-documentation and drawings and/or maps depicting the final configuration will be submitted to the Corps up completion of the construction activities.

Gully Repairs – the final HMMP will be revised to reflect the following performance standards for the repaired upland gullies. These features will be monitored annually until the performance criteria are met:

• No development of excessive erosion (e.g. gullies) following a large storm event (e.g. 3 inches of rain in 24-hours which is roughly equivalent to the 10-year, 24-hour storm event)

• Vegetative canopy cover at least 70 percent of adjacent habitat.

As described previously, gullies within Waters will be evaluated by a credentialed practitioner of induced meandering (e.g. Zeedyk or Clothier) to determine if this technique would be appropriate to repair the gully. If induced meandering, or similar technique, is appropriate, performance standards will be identified by the professional. Trends that may be evaluated as part of this monitoring effort include:

• Bankfull width-to-depth ratio increasing

• Width of flood prone area increasing

• Mean particle size in stream bed decreasing

• Slope decreasing

• Sinuosity increasing

• Meander width ratio increasing

Photo-documentation and drawings and/or maps depicting the final work will be submitted to the Corps upon completion of the construction activities.